SEPTEMBER
1961
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35¢

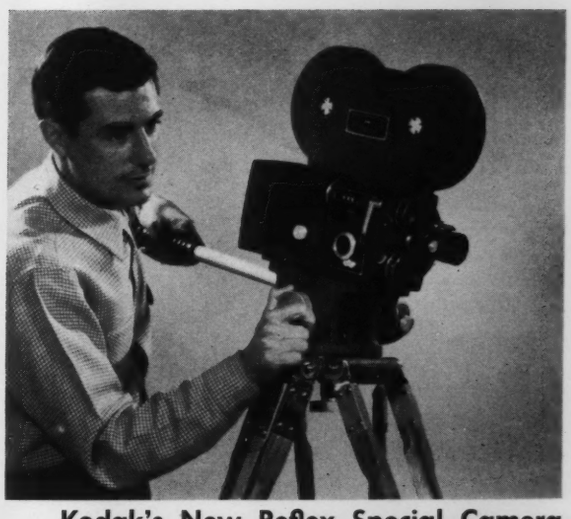
AMERICAN Cinematographer

The Magazine of Motion Picture Photography

Sharp Eyes For Space-Age Engineers
Page 542

Filming Miniatures and Special Effects
Page 532

CBS-TV's Man In Asia
Page 538



Kodak's New Reflex Special Camera
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★ **Shooting A "Problem" Picture**

★ **High-speed Cinematography in 3-D**

★ **Importance of Camera Point-of-View**

Also: • BEHIND THE CAMERAS • QUESTIONS & ANSWERS • WHAT'S NEW •

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*Mr. Margulies was a 1959 nominee for the National Academy of Television Arts and Science Emmy Award for "Lawless Years" which was photographed on Du Pont motion picture film.

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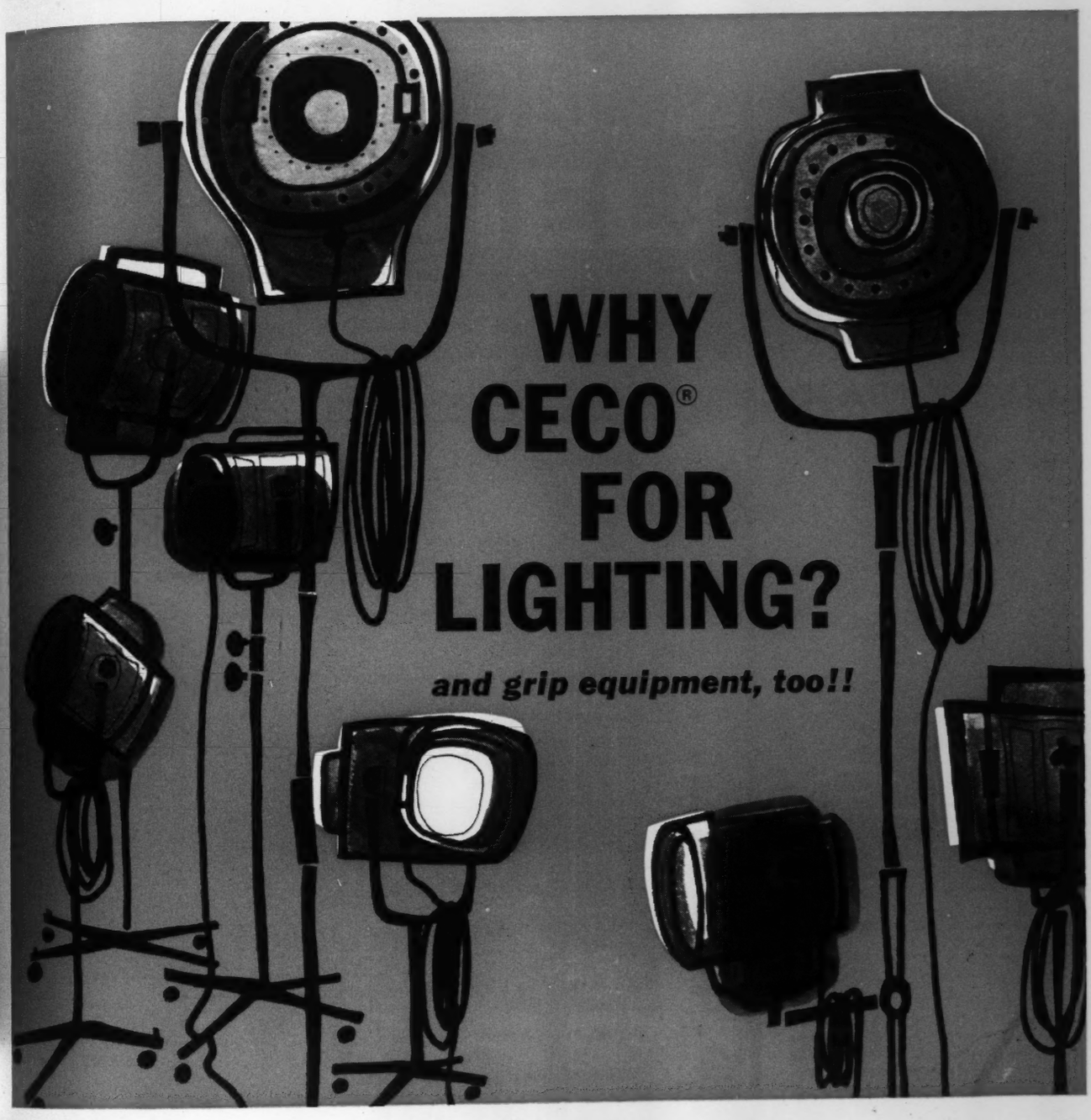

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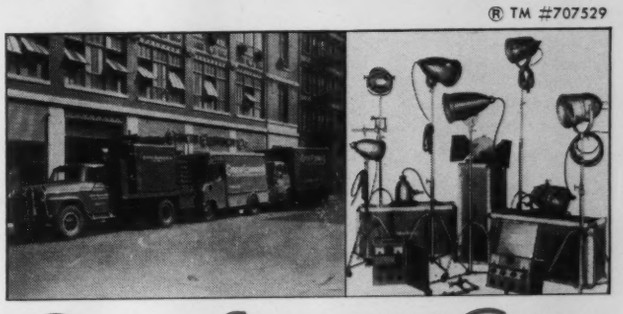

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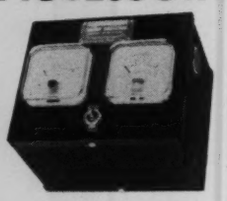

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Editorial and Business Offices: 1782 North Orange Drive, Hollywood 28, Calif.
Telephone: HOllywood 7-2135

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ON THE COVER

TWO D. B. MILLIKEN cameras (top, left) mounted for dual-tracking of a test vehicle—just one of many camera set-ups used today to provide records for space-age engineers. Story on page 542. How miniature sea scenes are filmed in studio "tank" is shown in photo at top, right, and described by Herb Lightman on page 532. Wade Bingham, CBS-TV news cameraman (back to camera, bottom-left photo) photographs news commentator against backdrop of Hong Kong harbor. Story begins on page 538. Kodak's slick new 16mm camera, the Reflex Special, is pictured at bottom, right, and described on page 543.

AMERICAN CINEMATOGRAPHER, established 1920, is published monthly by the A. S. C. Agency, Inc., 1782 N. Orange Dr., Hollywood 28, Calif. SUBSCRIPTION: United States and Canada, $4.00 per year; Foreign, including Pan-American Union, $5.00 per year. Single copies 35 cents; back numbers 45 cents; foreign single copies. 45 cents; back numbers, 55 cents. Advertising rates on application.

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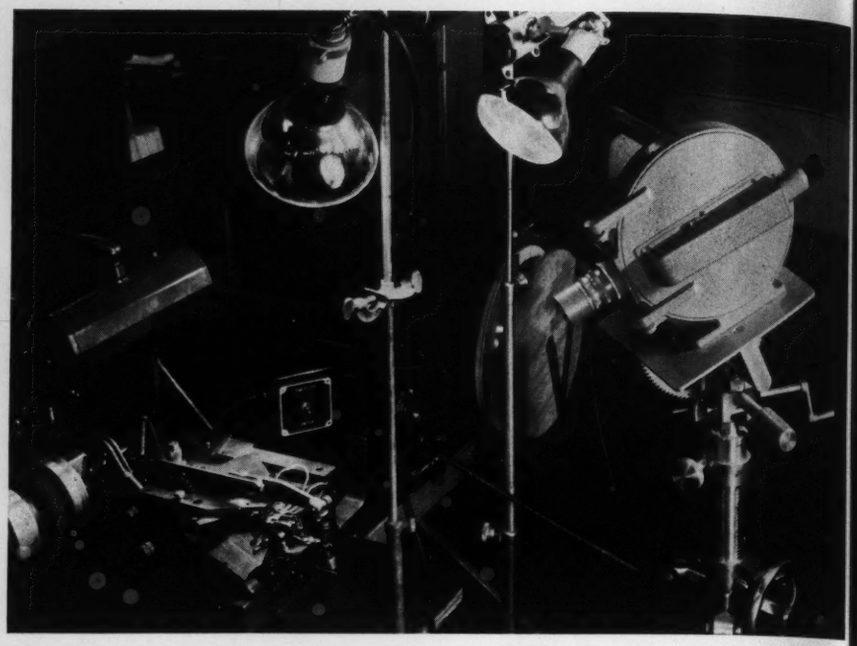

THE FASTAX high-speed motion picture camera in a typical set-up for a time-magnification study of a mechanical operation. In the shutterless Fastax camera, the film moves continuously instead of intermittently.

HIGH-SPEED

Some pertinent facts on the burgeoning new photographic science that slows fast motion to a snail's pace.

By ALVIN D. ROE

A PHENOMENON of motion picture photography is the rapidity with which its scope has been enlarged in recent years to make important contributions in many fields far removed from that of entertainment for which it was originally conceived. Chief among these has been high-speed photography in which images are photographed on motion picture film travelling at fantastic rates —1,000 fps and more on sprocketed 16mm film. (Beckman & Whitley, Inc., claim rates up to 4,300,000 pictures per second with Dynafax and Magnifax cameras.—ED.).

It is not surprising, therefore, that professional motion picture cameramen in increasing numbers are seeking experience and knowledge in the use of high-speed cameras. Applications of high-speed photography range from recording complex mechanical operations so they may be studied on the screen at greatly reduced speed, to recording phenomena in the complex fields of satellite and rocket engineering.

John H. Waddell, pioneer designer of rotating prism high-speed motion picture cameras, and author of numerous articles and a book on high-speed photography, has also written a comprehensive article on the subject, which appears in the *American Cinematographer Manual.* High-speed motion picture photography, Mr. Waddell explains, is the recording on film of a action or operation at frame rates greater than those obtainable with a conventional motion picture camera having an intermittent shutter.

The term "slow motion" photography has been applied to the results of high-speed cinematography because the screened action is appreciably reduced in speed when the film is projected at the normal speeds of 16 or 24 frames per second.

"The high-speed motion picture camera," Mr. Waddell explains in his article in the *Manual,* "literally magnifies time. If a subject in motion is photographed at 1,000 frames per second, the time magnification factor becomes 62.5 when the film is projected at the silent film speed of 16 fps; or 41.67 times when it is projected at 24 fps sound speed. Such magnification rates

Continued on Page 512

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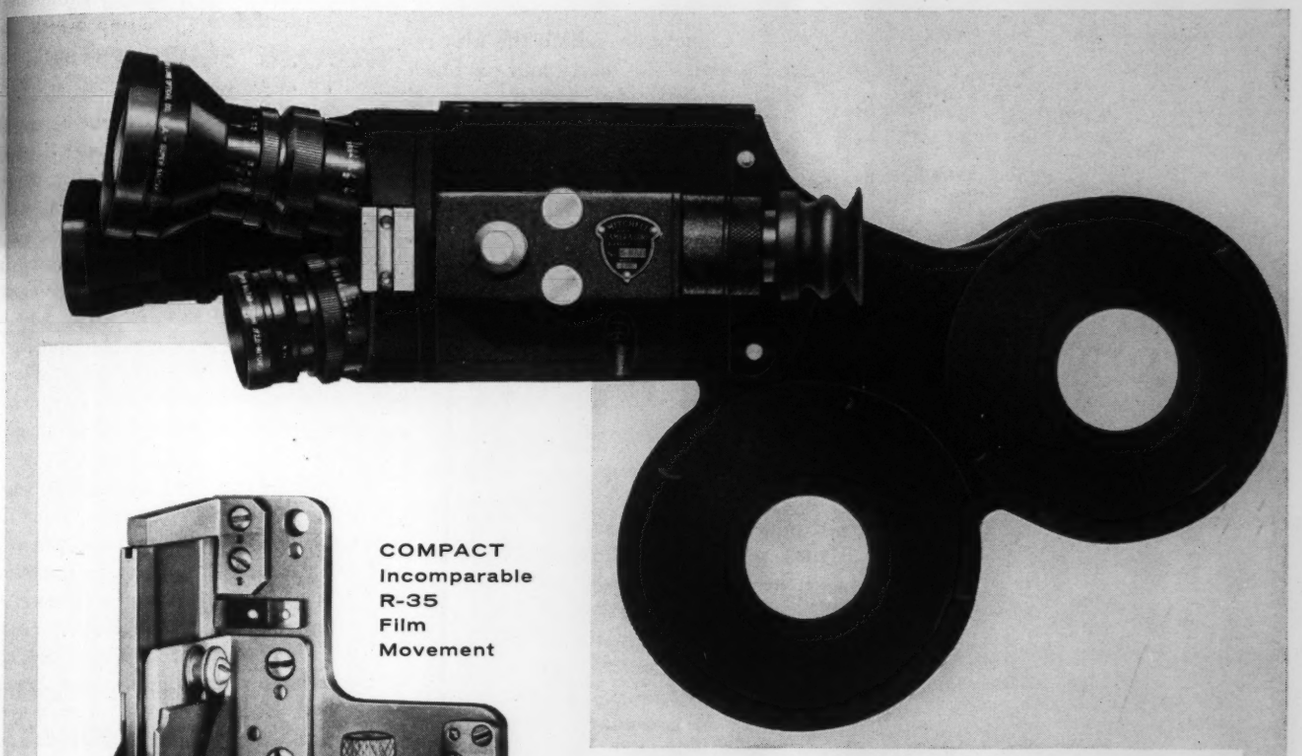

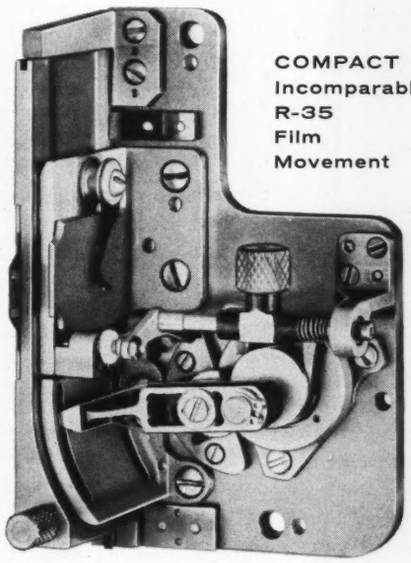

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HIGH-SPEED

Continued from Page 510

are determined by the following formula:

$$\text{Magnification} = \frac{\text{Time} \cdot \text{Taking Rate}}{\text{Projection Rate}}$$

"The cameras employed for high-speed photography fall into two general classes:

1) Continuously moving film cameras
2) Cameras in which the film remains stationary and having a continuously moving optical compensating component.

"The continuously moving film cameras are sub-divided into the following groups:

Rotating Prism,
Rotating Mirror,
Rotating Lens,
Synchronized-flash."

The ensuing paragraphs explain briefly the attributes, functions and applications of each type camera:

The rotating prism camera employs the principle of refracting the image through a continuously rotating parallel plate prism moving at the same velocity as the film. The prism design depends on the size of picture desired, the index of the glass used in the prism and the angle of rotation through which the pictures are exposed. The shutters may be either of two kinds: the barrel or the slotted disc. The barrel type can reach much higher speeds than the disc type and hence has greater flexibility. In the most recently designed high-speed cameras, picture quality and steadiness, apparent on projection, are being obtained that closely approximate that of the intermittent movement camera. The rotating prism cameras are comparatively light in weight. One camera capable of taking 10,000 16mm pictures per second, weighs slightly more than ten pounds. Some are light enough to be hand-held and may be operated from portable battery packs. Cameras of this type are: (1) Fairchild, (2) Fastax, (3) Fastair, (4) Magnifax (Kodak Type 3), (5) Photosonic, and (6) Waddell.

Rotating Lens and *Rotating Mirror* cameras utilize lenses or mirrors to achieve the optical compensation necessary to synchronize the moving image (subject) and the velocity of film travel. As yet such cameras have not been produced on a commercial scale in the United States.

Synchronized Flash Cameras employ a commutator-type component to fire a spark or electronic flash lamp at selected intervals to expose motion pictures on continuously moving film. Originally no shutter was used in cameras of this type. Later, internal triggering devices were installed in some of these cameras which ignited the spark or electronic flash unit. Cameras of this type offer the added advantage of optical compensation which eliminates vertical smear of the picture image.

Stationary Film Cameras are designed for ultra-high-speed photography. As their name implies, the film, usually a short strip, remains stationary within the camera and the subject image is exposed on it by projection from a rotating mirror, rotating lens, or lens-prism combination. When required, the photographic product of these cameras can be converted to conventional motion pictures on sprocketed film by means of optical printing process.

Rotating mirror re-imaging cameras provide fantastic picture taking rates up to 33,000,000 pictures per second for a limited interval. The lenticular or "lenslet" type camera will record pictures at rates up to 250,000 per second on 4"x5" sensitized plates. Such cameras have limited application. Synchronized electronic-optic and magneto-optic shutter camera pictures have been printed as progressive-step motion pictures by a process of printing each individual exposure several times before advancing to the next.

With these ultra-high-speed cameras, the percentage of picture taking speed spectrum is (approximately):

Pictures Per Second	*Percentage*
Up to 1,000	50
1,000 to 5,000	30
5,000 to 20,000	15
20,000 to 100,000	+ 1
Above 100,000	− 1

Films used in high-speed motion picture cameras are the commercially available orthochromatic, panchromatic, infrared and color emulsions. In some cases (notably on cameras of earlier design) film had to be ordered specially for high-speed cameras. Cameras of more recent design use any of the available packaged films.

Continued on Page 514

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HIGH-SPEED

Continued from Page 512

In most cases, reversal film is used in high-speed cameras employed by industry and research laboratories, which permits direct screening of the results for qualitative analysis by the engineer or scientist. Military installations generally use the negative-positive process or evaluate results directly from the negative. In such cases, measurements are made from the negative on a frame-by-frame projector for a quantitative analysis.

At exposure rates above 1,000 pictures per second, the reciprocity loss in exposure may adversely affect the results on negative or reversal film.

Rotating prism cameras, such as Fastax, Fairchild, Beckman & Whitley and Waddell, have a slightly different exposure cycle, which varies between 1/3 and 1/10 the reciprocal of the picture taking rate. The effective shutter speeds become a factor related directly to the open time of the prism/aperture combination as compared to the closed time between frames. At 1,000 pictures per second, for instance, the exposure will vary from 1/3,000 to 1/10,000 second, depending upon the combination of the cutoff area of the prism corners and the height of the aperture plate.

For example, a Fastax camera with a *normal* aperture plate traces a ray of light through the optical system and exposes it to the film for a period of time equal to ⅓ the total time necessary to advance to the next frame position. Therefore, for a frame rate of 1,000 pictures per second the effective shutter speed would be:

$$\frac{1}{3} \times \frac{1}{1{,}000} = 1/3{,}000 \text{ second}$$

With an aperture plate height of .030 inches the factor is 10. Therefore, for a picture rate of 1,000 pictures per second the effective shutter speed would be:

$$\frac{1}{10} \times \frac{1}{1{,}000} = 1/10{,}000 \text{ second}$$

For an aperture plate height of .003 inches, for instance, the factor would be 100.

To facilitate the calculation of exposure with most exposure meters, the prism/aperture factor can be *divided* into the ASA Exposure Index of the film and the exposure read directly as a reciprocal of the frame rate. For instance, on the basis of a speed of 1,000 pictures per second, and a normal aperture and a film index of 160:

Divide 160 by 3 = approximately ASA 50.

Then read the correct f/stop opposite 1/1,000 second.

If an aperture of .030 inches is used, the ASA Exposure Index of 160 is divided by 10, and equal ASA 16, and again the f/stop is read opposite 1/1,000 second.

Photo-Sonics high-speed cameras are rotating prism cameras equipped with disc shutters. Exposure times for these cameras are computed in the same way as for any standard motion picture camera. The basic formula is:

$$ET = \frac{A}{360°} \times \frac{1}{S}$$

ET = Exposure Time
A = Shutter Angle in Degrees
S = Camera Frame Speed

For example, for a camera equipped with a 72° shutter and exposing 1,000 frames per second, exposure would be calculated thus:

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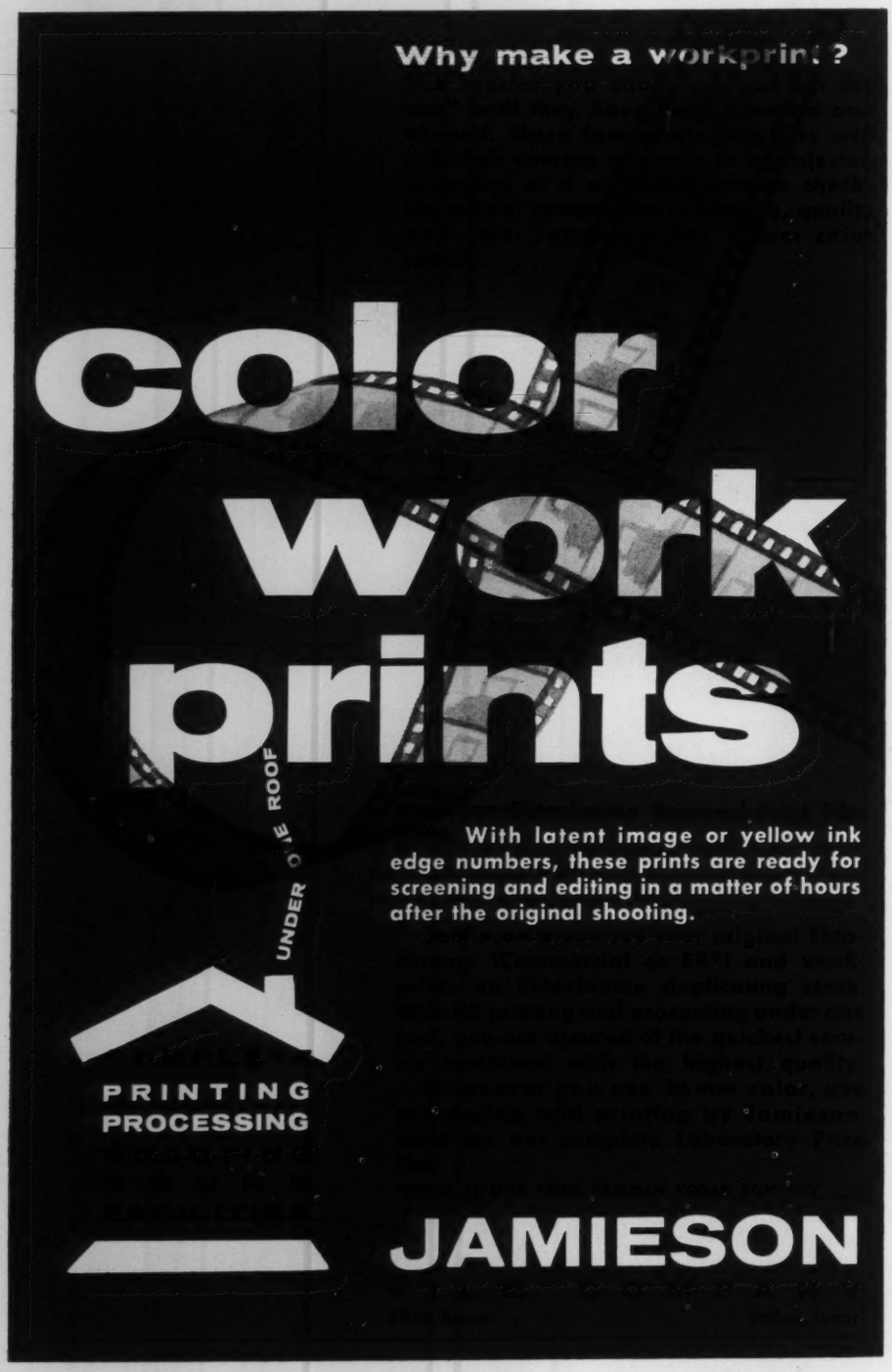
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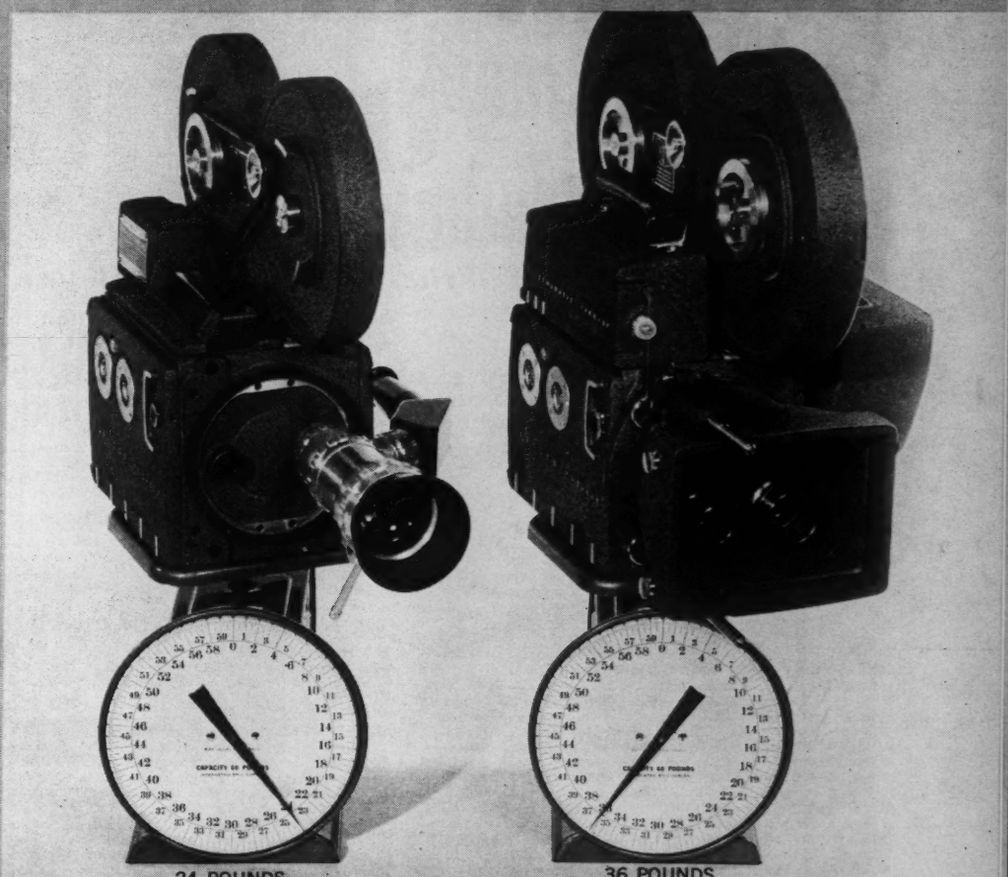

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AURICON PRO-600 Special, 3 lens turret; critical focuser; telefinder system, VA galvo; TV-T shutter; RA-31 amplifier; 2-400′ mag; zoom door; door w/B&H positive finder; trunk. $3575 value, likenu $2850.00
MAURER 05; Syncmotor; 400′ magazine; viewfinder; 3 lens turret. Originally $5500.....$1495.00
B&H FILMO Turret Automaster Autoload, f1.9 lens, case. Originally 0350.....$79.50
AURICON SUPER 1200′ parallax finder, variable shutter, 2-400′ mags., case. Less galvo. $5300 list.....$2495.00
CINEPHONIC, Magnetic recording, 400′ Mitchell mag, 3 Elgeet lenses, turret, transistor amplifier, power supply, mike, Pro Jr. tripod and triangle. Originally $3000, likenu $1495.00
BOLEX, Converted 400′ mag.; rackover; telescopic finder; 110V wild motor. $900 original cost....$449.50

★ CAMERA ACCESSORIES

HOUSTON FEARLESS TC-1 Television Camera Crane. Factory price $5800, likenu.....$3495.00
SCANOPTIC ANAMORPHIC System; includes basic CinemaScope type lens; 4 f2.3 Baltar camera lenses—40/50/75/100mm for Mitchell N.C. $9000 value.....$3300.00
CINE VOICE Portable Power Supply, nickel cad. battery, charger, $195 value $125.00
ARRIFLEX Voltabloc Powerpacs, used. With built-in charger $110. Less charger $99.50
B&H 400′ bipack magazine $149.50
PHOTO RESEARCH Spectra Meters with filters, sphere, case. 2 Color $129.50
NATIONAL CINE Crab Dolly, very good condition. $4750 original cost $3750.00
RABY heavy studio dolly $895.00
MOTORIZED DOLLY w/revolving head 7′ boom height; 2 seats; hihat; brackets for 6 lites. Orig. $4000 .....$695.00
AKELEY Gyro Tripod, $1100 originally $595.00
EYEMO 6V Motors, 8/48 fps; New $74.50
CECO CINE Special Blimp, syncmotor $395.00

★ LABORATORY EQUIPMENT

ART REEVES SENSITESTER, 16/35 combined sensi/densitometer, likenu $795.00
EASTMAN EDGE NUMBERING machine with new numbering block $1445.00
DUPONT 35mm EDGE NUMBERING Machine, complete $1295.00
PHOTOVOLT Densitometer 16/35mm with soundtrack accessory. Cost $750 when new $395.00
PAKO Heat Exchangers, controls solution temperatures accurately. $300 value. New (Surplus) $98.50
FRIED Light Scene Tester, 1 to 11 exposures. As is $99.50
EASTMAN Electric 35mm Film Waxing Machine with heating element and motor. Originally $1500. Rebuilt.....$495.00

★ ANIMATION & SPECIAL EFFECTS

PATHE 35mm FILMSTRIP Camera; B & L Lens; 4-200′ magazines; single frame, forward and reverse syncmotor, frame counter; push button switch. Reconditioned $695.00
TEL-ANIMAPRINT Hot Press, Electronic Control, new demonstrator $459.50
CINE SPECIAL ANIMATION Motor, New.....$299.50
ACME 7′ Animation stand, E/W/N/S movements, sliding pegs, B&H 35mm camera, Acme stopmotion motor. $12,500 value $3795.00
TEL-ANIMASTAND, art table N/S/E/W, rotary movement. New demonstrator. $3000 value $1795.00
B&H 35mm Animation Cameras; 400′ magazine; dissolve $3500 original cost $1250.00
SAME with thru-lens focusing $1750.00

★ MOTION PICTURE PRINTERS

B & H 16mm Model JC Printer, reconditioned $3995.00
RCA REDUCTION PRINTER, 35/16mm soundtrack, 180′ per minute. $9000 value, excellent.....$3500.00
CUSTOM BUILT 35mm Step Printer, pilot pin registration $395.00
DEPUE PRINTER 35mm DUAL SOUND & PICTURE. Prints from two negatives.....$1295.00
TEL-AMATIC 16mm SOUND & Picture Printer. Semiautomatic light change.....$995.00
B&H Printer, 35mm step contact, pilot pin spreaders, semi-automatic light change. Original cost $4000.....$995.00
CINECOLOR Double Head 35mm Step Printer with automatic lite change and timing device. Originally $12,000. (Bank foreclosure) $2495.00

★ LIGHTING EQUIPMENT

KLIEGL FLUORESCENT Fixtures w/separate ballast, pantagraph hanger. Take 6 slimline 64″ lamps. $397 list, excellent $99.50
LARGE SILVER REFLECTORS, hardwood hinged frames with pronged support.
4 ft. x 4 ft., double surface $37.50
4 ft. x 6 ft., single surface $42.50
DOUBLE BROADS with stands, 1000W lamps.....$59.50
10,000W Fresnel Spot heads, cost over $500.....$249.50
BARDWELL-McALISTER 750W Baby Keglite heads..$39.95
BARDWELL-McALISTER 2000W Spots, likenu.....$89.95
MOLE RICHARDSON 2000W Spots, black #412....$79.95
MOLE RICHARDSON 5000W Spots, black #415....$149.95
MOLARC 150 amp. head, grid and pedestal. List price $2410 when new $795.00

★ RECORDING EQUIPMENT

MAURER D. 16mm Optical Recorder, twin track negative/positive; 4 pos. mixer; noise reduction amplifier; 400′ mag. Excellent.....$3250.00
RCA 35mm OPTICAL RECORDERS, 220V 3 ph syncmotors, bilateral galvo, 1000′ mag. used, as is $1995.00
KINEVOX 4-position mixer, AC operated, VU meter. Cost $495.....$225.00
STANCIL HOFFMAN Model S-6 Sync 17.5mm Mag. Recorder & Reproducer, P24C Power Supply, playback amplifier, cases. Originally $2800.....$895.00
STANCIL HOFFMAN S-5 edge or center 16mm track. Originally $2000. Complete.....$995.00
AURICON RT80 16mm Optical Recorder, VA Amplifier NR22. cases. Originally $1100.....$395.00
MAGNAGRAM (now Magnasync) 16mm center track recorder. Counter; 3 motors; 1200′ capacity. Originally $2350. As is.....$525.00
RCA PHOTOPHONE 35mm Fantasound film phonograph with Selsyn motors. Orig. $6,500 .....$495.00

★ PROJECTORS, BACKGROUND, PREVIEW

BACKGROUND Arc Projector; 35mm movies or slides; 120 amp. arclamp; rheostat; lenses. Cost $15,000 to build. unassembled, as is, plus crating $395.00
FILMCRAFT 35mm Movie Background Process Outfit. Write for details. $15,000 value (Bank foreclosure)..$1995.00
HOLMES 16mm ARC PROJECTOR; Strong babyarc; 15A rectifier; pedestal; less amplifier.....$295.00
SIMPLEX Acme 35mm Arc Sound Projector with pedestal .....
PREVIEW Interlock Projector, DeVry, 1000W lamp picture and sound simultaneously.....

★ MOVIOLAS, EDITING MACH

CECO 35mm VIEWER, $500 orig. Good condition.
MOVIOLA PREVIEW 35mm UDPVS, separate pict soundhead, on rolling stand. 4″x6″ rebuilt. .....
Same with 8″x10″ screen.....
MOVIOLA 35mm UDS, separate picture and sou on rolling stand.....
MOVIOLA 35mm UDCS ,separate sound and c picture/magnetic optical, footage counter. On stand. Excellent.....
MOVIOLA 16mm ULC bullseye composite pictu sound, rolling stand.....
ACMIOLA 35mm Viewers w/stands, 6″x8½″ motorized. $1500 original cost.....
AKELEY 35mm Viewer, sound and composite aerial image. Original cost $3000; closeout

★ FILM PROCESSING EQUIPM

GPL 401 HI-SPEED 16 mm Spray Processor, Reconditioned. Originally $8000.....
HOUSTON 16mm PROCESSOR A-11 will handle changing rollers. Dalite loading, neg/pos/reversa control incomplete, otherwise appears good ...
FILMLINE 16mm RACETRACK REVERSAL Process dles 200′ of film dry-to-dry in 3½ minutes. cost, $5450. Our special price.....
HOUSTON FEARLESS 19AS 16mm COLOR Proce assembled. Has 17 S.S. tanks 70″ high, extra drive assembly, complete drybox. Less motors, and refrigeration. Worth $12,000. FOB ida .....
HOUSTON FEARLESS 22B neg./pos, processor; ture control; recirculation; 1800′ per hr. As is
MAMMOTH HOUSTON Color Processor, 16/35mm, Ektachrome, neg./pos., up to 1200′ per hr., less steel tanks, one fiberglass lined. Full perature control. Recirculation, air supply, gees. Cost Cuban government $35,000. Reb new .....

★ CUTTING ROOM SUPPLIE

B&H FOOT SPLICERS, excellent condition. 35mm, 70mm.....
FOSTER AUTOMATIC REWIND on table w/ lite, 110V AC 60 cy. hvy. duty motor, foo control, speeds zero to 875 RPM .....
CRAIG 16mm Editor Viewers, excellent.....

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SPENCER INDUSTRIAL VACUUM cleaner, rollab new hose, recond. $700 originally.....
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720 Amp. GENERATOR, 120DC, 100HP 220/44 motor, panel, 7½HP starting motor, silenc coil. Good for 25% overload. $10,000 orig.
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INTERLOCK DISTRIBUTOR, primary 110V 1ph, 220V 3ph for recording studios.....
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INTERLOCK MOTORS 220V 3ph for Mitch Cameras .....

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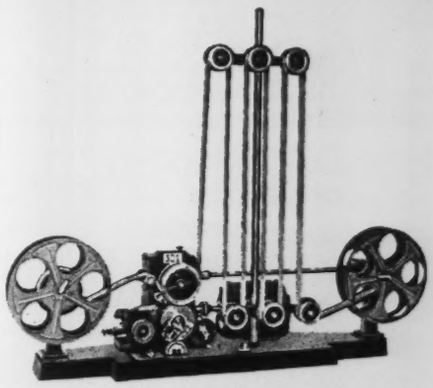
Model 500

PRICES START AT $2995.

Entirely self-contained with every accessory. Fully automatic with many exclusive advantages—requires no attendance and reduces maintenance and cleaning to a minimum.

A Complete Line of Allen Film Processors are Available for Both 16mm and 35mm

MOY 16-FRAME 16mm Film Edge Numbering Machine



Unnumbered films cause confusion and loss of valuable time!

This NEW model overcomes the problem of matching 16mm film to 35mm. Provides a direct numerical reference between both sizes **$3750**

STANDARD MODELS

Designed to edge number every foot of 16mm, 17½mm, 35mm films and simplify the task of checking titles and footage. The MOY VISIBLE EDGE FILM NUMBERING MACHINE replaces cue marks, perforations, messy crayons, punches and embossing —does not mutilate film. Both negative and positive films can be numbered. Non-magnetic parts do not affect magnetic film.
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For changing operation from 16mm to 35mm or 35mm to 16mm. Kit Price..... $875

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University of Southern Calif., Los Angeles
University of Illinois, Urbana, Illinois
Telefilm, Inc., Hollywood, Calif.
Consolidated Film Labs., New York City
Cinerama Productions, New York
Columbia Broadcasting System, N. Y.
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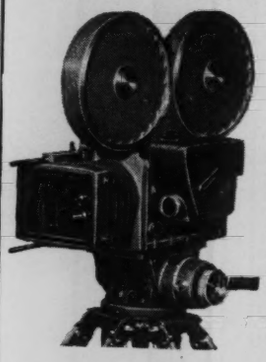
Camera Mart

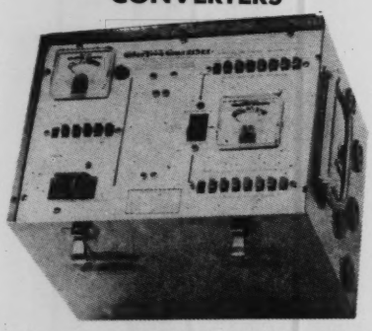
AURICON CAMERAS
PRO-600 and SUPER-1200



Single-system 16-mm sound-on-film cameras. Latest model Cine-Voice II sound cameras. TV Kinescope shutters, new and used in stock.

Pro 600 Special Lightweight outfit with Film Magnetic Sound System.

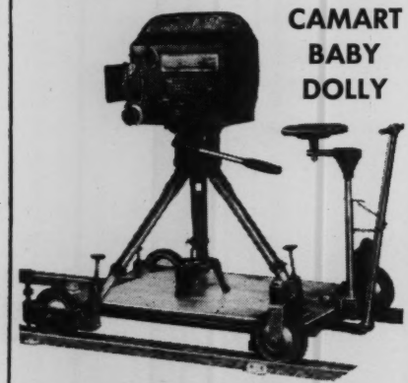
COLORTRAN CINEMASTER CONVERTERS



Provides up to 50,000-watts of Kelvin-controlled illumination for photography. Cinemaster II, with pushbutton controls, available in 3 models:

50,000 watts.....$309.00
40,000 watts..... 258.00
25,000 watts..... 168.00

CAMART BABY DOLLY



The only portable four-wheel dolly that provides balance and stability. Adjustable seat for cameraman. Platform accommodates assistant.....$425.00
Dolly Tracks Available

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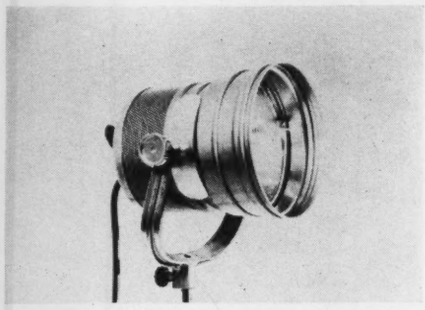
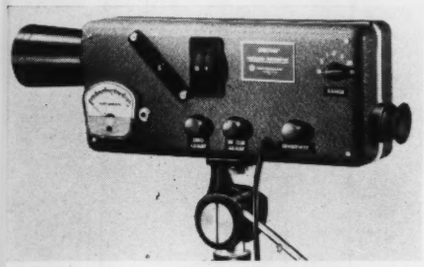


Colortran Cine-Queen

A new high-intensity AC-DC wide-flood lighting unit is announced by Natural Lighting Corp., 630 So. Flower St., Burbank, Calif. Trade-named the Cine-Queen, unit employs new 1500-watt G-E lamp which produces a rectangular area of flood illumination at 3350° Kelvin, using 120-V AC or DC power source. With this new Colortran unit, no Colortran converter is needed because of the pre-boosted type of filament construction in the G-E lamp. The illumination produced equals that of a standard PAR 64 medium boosted flood.



Spectra-Pritchard Photometer

A convenient and highly-sensitive brightness measuring instrument is the Spectra - Pritchard Photometer, now manufactured and distributed by The Photo Research Corp., 837 No. Cahuenga, Hollywood 38, Calif.

Instrument has a telescopic viewing system and is equally sensitive to light of any type of polarization. The objective lens can be adjusted to extend the focal range from three feet to infinity. A closeup lens attachment permits focus at distances nearer than three feet. The field of view (size of spot measured) can be varied by inserting various mirror-apertures. The angular fields subtended by these apertures are 6, 15, 30, 60, and 120 arc minutes. A technical data sheet is available.

Dynamax Power Pack

The Dynamax Power Pack is a sintered-plate nickel cadimum storage battery having a capacity of 60 to 100 ampere hours. A flat voltage curve is maintained during discharge (use) and high discharge rates up to 50 amps. are possible. According to the distributor, Gordon Enterprises, 5362 No. Cahuenga Blvd., North Hollywood, Calif., use of the Dynamax eliminates torque-motor problems with Arriflex cameras. A dual power-pack for the Arriflex produces either 9.6 or 16 volts, switch-controlled; 12 to 24 volt units are also available for cameras such as Hulcher and others having similar power requirements.

Heat-reducing Filter

A new liquid heat-reducing filter designed especially for use on 35/70mm motion picture projectors is announced by D & F Products, Inc., 1350 No. Highland Ave., Hollywood 28, Calif. Filter consists of two Vicor plates with a liquid between them and has an outer hollow rim for the circulation of cooling water, either from a re-circulator or from a tap water source. Because of its shallow construction and wide opening, the filter has no effect on light distribution and does not upset the illumination system of the lamphouse. According to the manufacturer, tests with the filter have effectively reduced temperatures at center of projector gates 30 to 40 percent.

European Equip. Rentals

Claude Chevereau, President of Chevereau, S.A., Paris, announces the ex-

Continued on Page 521

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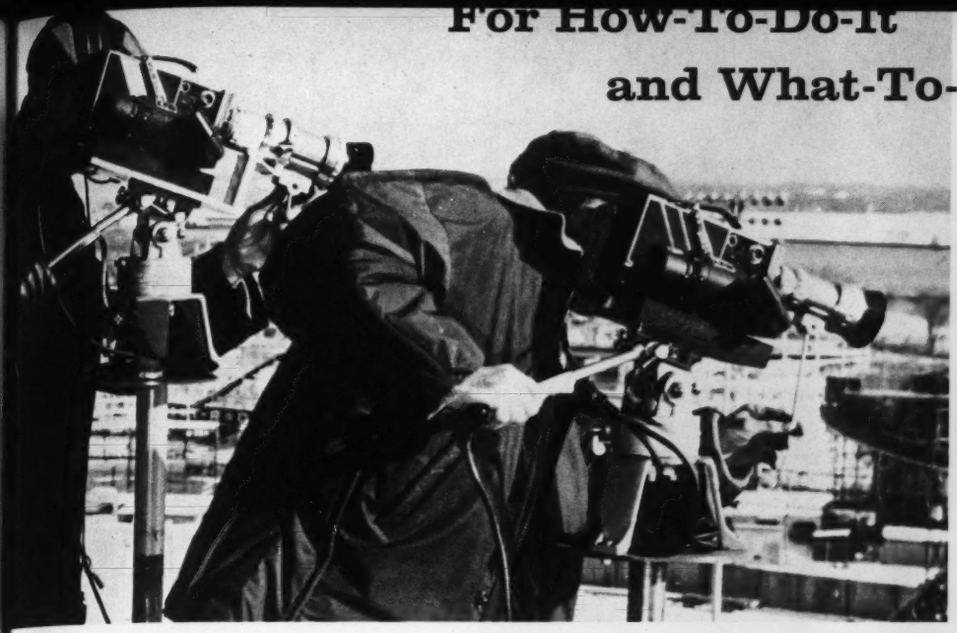

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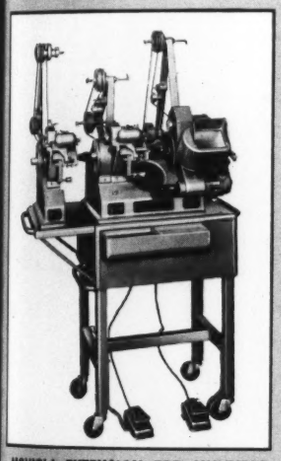

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First with a built-in variable condenser system. The ultimate in 4" X 5" enlarging equipment.

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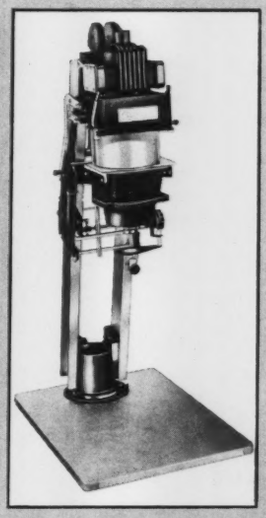
3 meters in 1— illumination, contrast and brightness. Built-in computer; dual light scale.



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Converts for use with external magazines, 400, 500 and 1200 ft. Veeder footage counter included. Torque take-up motor.

RAPROMATIC FILM PROCESSOR FOR 16, 35, AND 70MM

Revolutionary technique develops and fixes film as you shoot. Superior image quality. Projects in seconds, fits all cameras.

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- ☐ CECO Ditty Bag
- ☐ FREZZO-LITE Model "500A"
- ☐ CECO Synch Motor for Kodak K100
- ☐ CECO 35mm Stop Motion Projector
- ☐ CRAMER Continuous 16mm Processor
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- ☐ PROTECT-A-PRINT
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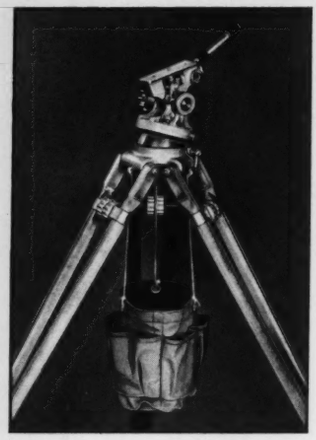
MAGNASYNC TYPE 5 SOUND RECORDER
The most universally accepted sound system in America. Meets all SMPTE and Academy standards. A professional recorder for professionals. Available in split 16, 16, 17½ and 35mm.



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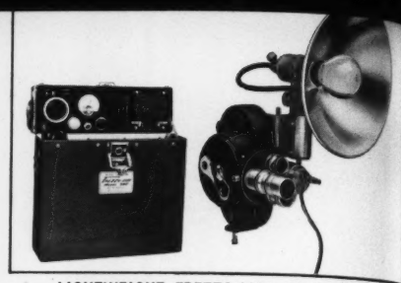
The ideal carry-all. Keeps necessary small equipment and tools accessible.



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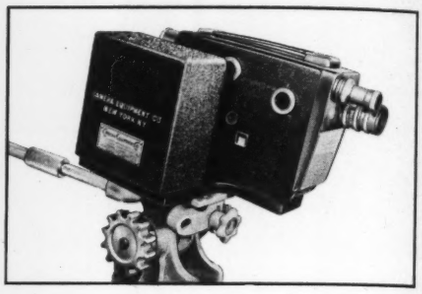

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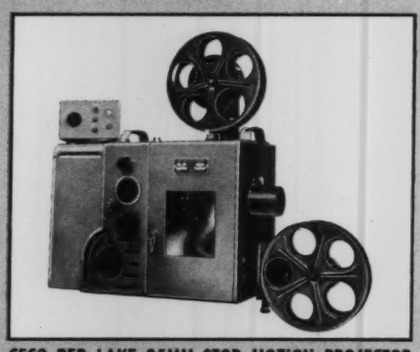
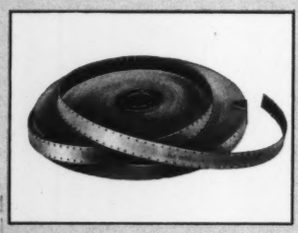
CECO is ready to equip you completely with everything from editing gloves to the world's finest Motion Picture and TV Equipment.



CECO RED LAKE 35MM STOP MOTION PROJECTOR
Variable speed remote control, forward and reverse. 8 to 24 pps; 1000 ft. capacity; positive single frame.

CRAMER CONTINUOUS 16MM PROCESSOR
Compact; economical; portable. Can be operated in daylight. Fully automatic.

CECO PRO JR. AND PRO SR. 3-WHEEL DOLLY
Collapsible; lightweight; ball bearing rubber casters. Jr. weighs 15½ lbs.; Sr. 18 lbs.



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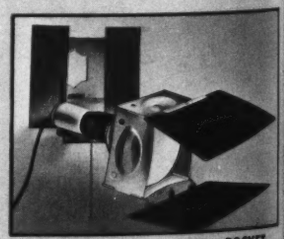
A 10 ft. leader on your film cleans film path, removes emulsion build-up, eliminates film scratch, increases print life.



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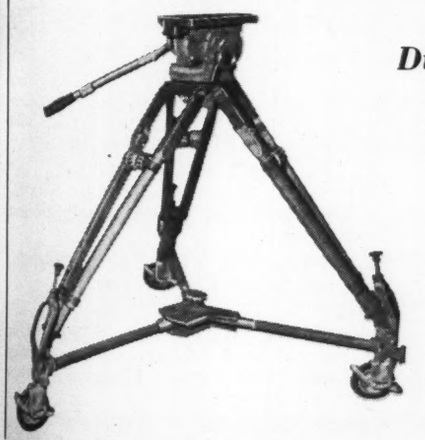

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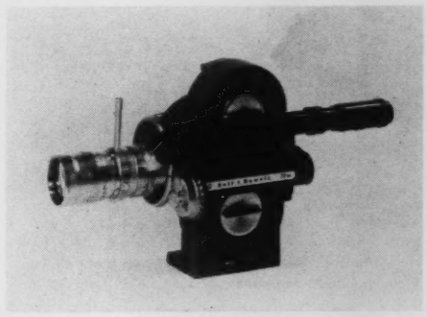
WHAT'S NEW

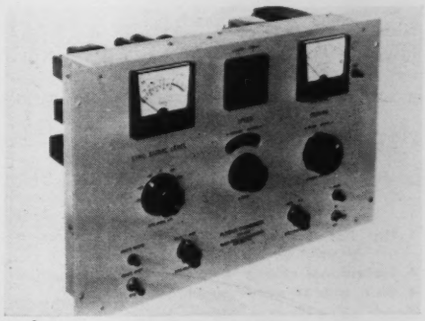
Continued from Page 518

pansion of company's continental camera equipment rental service through acquisition of additional equipment. Company is leading rental source of motion picture cameras, dollies, and cranes for both American and European film producers shooting on location in western Europe. Company's headquarters are at 20 Rue de la Chine, Paris 20, France.



VF Lens With Finder

The Traid Twenty-Eighty Variable Focal Lens features a built-in viewfinder and fits any 16mm camera equipped for C-mount lenses. Providing a range of focal lengths from 20mm to 80mm, for wide-angle, normal, and telephoto shots, the iris is constant at f/2.5 and focusing scale is 48" to infinity. Finder may be positioned for any spot in the 360° range around the camera and a framing mask can be rotated for horizontal positioning. The eyepiece closes to prevent feedback of light. Write Traid Corporation, 17136 Ventura Blvd., Encino, Calif.



Playback Synchronizer

A transistorized playback synchronizer for syncing ¼" tape playbacks with sprocket-driven film is announced by Magna-Tech Electronic Co., Inc., 630 Ninth Ave., New York 36, N. Y. Unit employes 60-cyc. or 14-kc sync track for control; can correct speed deviation of ± 20% from sync speed. List price is $1,290, F.O.B. N.Y.

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BEHIND THE CAMERAS

WHAT THE INDUSTRY'S CAMERAMEN WERE SHOOTING LAST MONTH

BY MARION HUTCHINS

NOTE: Asterisks following title indicates television film productions.

ALLIED ARTISTS

ROBERT KRASKER, "Bill Budd" (C'Scope: Anglo-Allied Prod.; shooting in Spain & England) with Robert Ryan and Peter Ustinov. Peter Ustinov, producer-director.

JOE BIROC, ASC, "Hitler" (Three Crown Prod.) wtih Richard Basehart and Mario Emo. Stuart Heisler, director.

CARL GUTHRIE, ASC, "The George Raft Story" with Ray Danton and Jayne Mansfield. Joe Newman, director.

CASCADE STUDIO

ELWOOD BREDELL, ASC, Commercials*.

COLUMBIA STUDIOS

FRED GATELY, ASC, "Hazel"*.

JACK MARTA, "Route 66"*.

DONALD GLOUNER, ASC, Commercials."

JOE MACDONALD, ASC, Commercials*.

BURNETT GUFFEY, ASC, Commercials*.

PHILIP LATHROP, ASC, "Experiment in Terror" (Geoffrey-Kate prod.; shooting in San Francisco) with Glenn Ford and Lee Remick. Blake Edwards, producer-director.

HARRY STRADLING, ASC, "Five Finger Exercise" (Sonnis Corp.) with Rosalind Russell and Jack Hawkins. Daniel Mann, director.

BOB HUKE, "Reach for Glory" (John Kohn-Jud Kinberg Prod.; shooting in England) with Harry Andrews and Kay Walsh.

ARTHUR GRANT, "The Pirates of Blood River" (Megascope & Eastman Color; Hammer Film Prods.; shooting in England) with Kerwin Mathews and Glenn Corbett. John Gilling, director.

PHILIP TANNURA, ASC, "Shannon"*.

IRVING LIPPMAN, "The Hathaways"*.

FRED YOUNG, "Lawrence of Arabia" (Super Panavision 70 & Technicolor; Horizon-American Prods.; shooting in Jordan) with Peter O'Toole. David Lean, director.

GERT ANDERSEN, ASC, "Donna Reed Show"*

ALDO TONTI, "Barabas" (Technirama 70 & Technicolor; Dino De Laurentis Prods.; shooting in Italy) with Anthony Quinn and Silvano Mangano. Richard Fleischer, director.

ARTHUR ARLING, ASC, "Notorious Landlady" (Kohlmar-Quine Prod.) with Kim Novak and Jack Lemmon. Richard Quine, director.

DESILU—Cahuenga Studios

ROBERT DE GRASSE, ASC, "Dick VanDyke Show"*; "Danny Thomas Show"*.

SID HICKOX, ASC, "The Andy Griffith Show"*.

HENRY CRONJAGER, "Joey Bishop Show"*; "Jack Benny Show"*.

DESILU—Culver City

CHARLES STRAUMER, "The Untouchables"*.

LOTHROP WORTH, ASC, "The Real McCoys"*.

DESILU—Gower Studios

WILLIAM SKALL, ASC, "Robert Young Show"*.

CHARLES VAN ENGER, ASC, "Lassie"*.

TED VOIGHTLANDER, "Ben Casey"*.

ROBERT PLANCK, ASC, "My Three Sons"*.

EUGENE POLITO, "Straightaway"*.

FAIRBANKS STUDIOS

RAY FOSTER, ASC, Commercials*.

FOX WESTERN AVENUE

JAMES VAN TREES, ASC, "Dobbie Gillis"*.

ROBERT HAUSER, "Bus Stop"*

RICHARD RAWLINGS, "Margie"*

FILMWAYS STUDIOS—New York

MORRIS HARTZBAND, "The Defenders"* (CBS) Boris Sagal and Buzz Kulich, directors.

GENERAL SERVICE STUDIOS

THOMAS TUTWILER, ASC, "International Golf Show"*.

ROBERT HAGER, "Perry Mason"*.

ARCH DALZELL, "Mister Ed"*

HARRY WOLF, "Hennessey"*.

INDEPENDENT

ERNEST CAPARROS, "The Miracle Worker" (Playfilms, Inc. for UA) with Anne Bancroft and Patti Duke. Arthur Penn, director.

DANIEL FAPP, ASC, "One, Two, Three" (P'Vision; Pyramid Prod.; A. G. Mirisch Co. for UA; shooting in Berlin) with James Cagney and Horst Bucholz. Billy Wilder, producer-director.

EMMANUEL ROJAS, "Out of the Tiger's Mouth" (Shooting in Hong Kong; Ruggles-Whelan Enterprises for Sutton Prods.) with Han-Yi. Tim Whelan, Jr., director.

LEO TOVER, ASC, "What a Wonderful Life" (Mirisch-UA; shooting in Florida) with Elvis Presley and Arthur O'Connell. Gordon Douglas, director.

FRED WEST, ASC, (Shooting in Nashville, Tenn.) Methodist Church Films.

FRANK PLANER, ASC, "The Children's Hour" (Wm. Wyler Prod.—Mirisch Co.; UA release) with Audrey Hepburn, Shirley MacLaine and James Garner. William Wyler, producer-director.

WINTON HOCH, ASC, "Soldiers 3" (Essex prods. for UA; shooting in Kanab, Utah) with Frank Sinatra and Dean Martin. John Sturges, director.

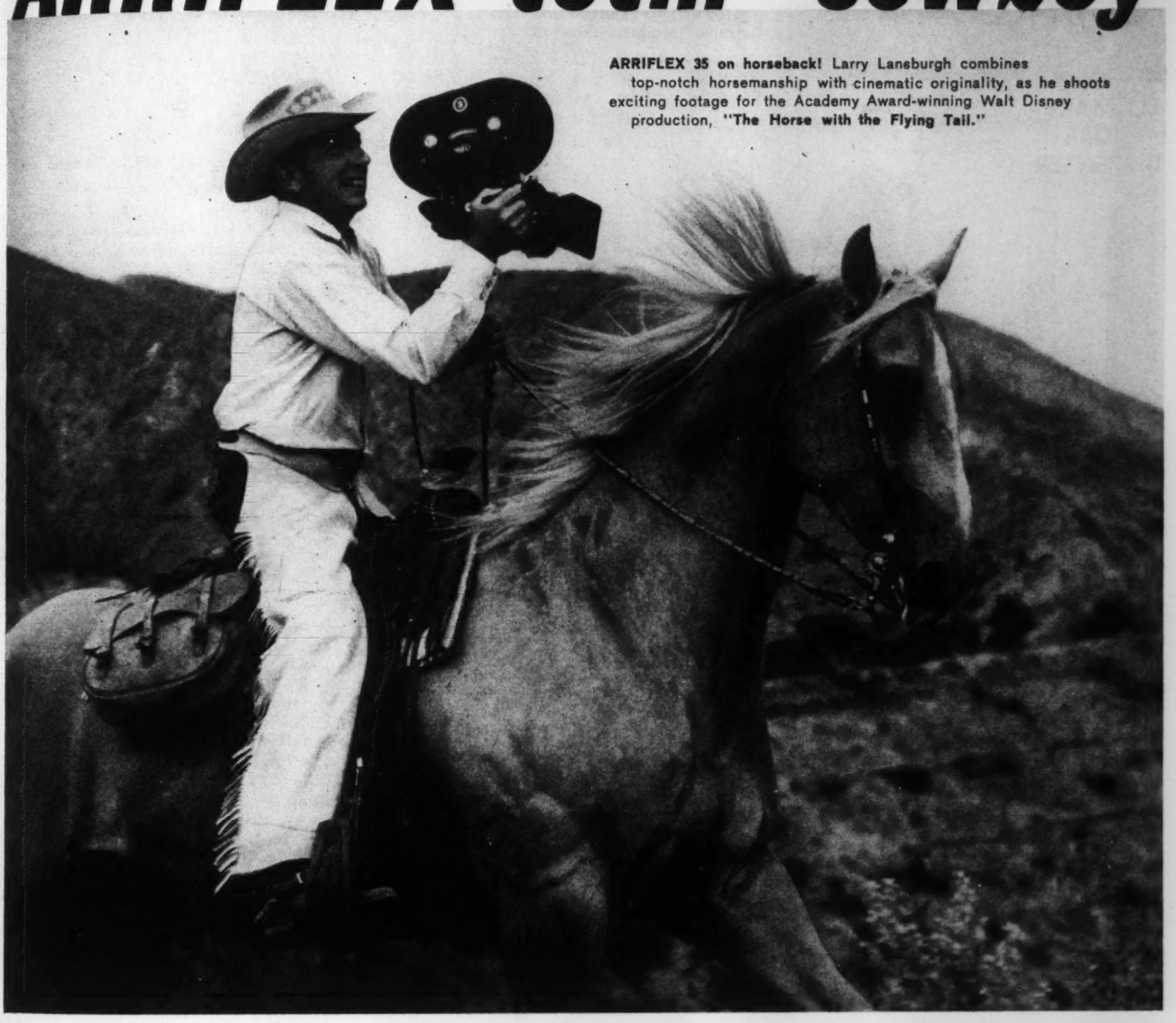
GILBERT WARRENTON, ASC, "Line of Duty" (Harvard Films for UA) with Chris Warfield and Erin O'Donnell. Edw. L. Kahn, director.

JACK HILDYARD, "The Road to Hong Kong" (Melnor Prod.; UA release; shooting in London) with Bing Crosby, Bob Hope and Joan Collins. Norman Panama, director.

HASKELL WEXLER, "The Intruder" (Roger Corman Prod.; shooting in Mo.) with Wil-

Continued on Page 524

ARRIFLEX®-totin' cowboy



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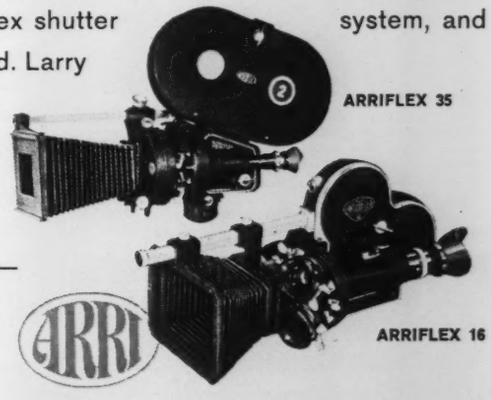

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BEHIND THE CAMERAS

Continued from Page 522

liam Shatner and Frank Maxwell. Roger Corman, producer-director.

ARTHUR ORNITZ, "Jack Town" (Pictorial Int'l, Inc.; shooting in Detroit) with Richard Meade. Wililam Martin, producer-director.

METRO-GOLDWYN-MAYER

MILTON KRASNER, ASC, "Sweet Bird of Youth" (Pandro S. Berman Prod.) with Paul Newman and Geraldine Page. Richard Brooks, director.

LUCIEN ANDRIOT, ASC, "National Velvet"*.

HARKNESS SMITH, "Dr. Kildare"*.

WILLIAM SPENCER, "Cain's Hundred"*.

JOHN NICKOLAUS, "Rawhide"*

GEORGE CLEMENS, ASC, "Twilight Zone"*

ROBERT PITTACK, ASC, "Father of the Bride"*

JOSEPH LA SHELLE, ASC & CHARLES LANG, ASC, "How the West was Won" (Cinerama; color; shooting in Paducah, Ky.) with James Stewart and Debbie Reynolds. Henry Hathaway, director.

ROBERT SURTEES, ASC, "Mutiny on the Bounty" (Ultra Panavision & Color; shooting in Tahiti; Arcola Prods.) with Marlon Brando and Trevor Howard. Lewis Milestone, director.

LIONEL LINDON, ASC, "All Fall Down," with Eva Marie Saint and Warren Beatty. John Frankenheimer, director.

PAUL VOGEL, ASC, "Wonderful World of The Brothers Grimm" (MGM Cinerama; Geo. Pal Prod.) with Laurence Harvey and Karl Boehm. Henry Levin and George Pal, director.

PARAMOUNT STUDIOS

ELLSWORTH FREDRICKS, ASC, "Escape From Zahrain" (P'Vision & Technicolor) with Yul Brynner and Sal Mineo. Ronald Neame, director.

WILLIAM MARGULIES, ASC, "Outlaws"*.

WALTER CASTLE, ASC, HASKELL BOGGS, "Bonanza"*

HAROLD LIPSTEIN, ASC, "Hell is for Heroes" with Steve McQueen and Bobby Darin. Don Siegel, director.

WALLACE KELLEY, ASC, "The Errand Boy" (Jerry Lewis Prod.) with Jerry Lewis and Brian Donlevy. Jerry Lewis, director.

FRANK PHILLIPS, "Have Gun Will Travel"*.

PARAMOUNT SUNSET STUDIOS

FLEET SOUTHCOTT, "Gunsmoke"*

LESTER SHORR, ASC, "Pete and Gladys"*.

REPUBLIC STUDIOS

CHARLES BURKE, "The Corruptors"*.

HOWARD SCHWARTZ, "The Rifleman"*.

WILFRID CLINE, ASC, "Robert Taylor Detectives"*

GEORGE DISKANT, ASC, "Dick Powell's Zane Grey Theatre"*.

REVUE STUDIOS

RUSSELL HARLAN, ASC, "The Spiral Road" (Shooting in Dutch Guiana) with Rock Hudson and Genea Rowlands. Robert Mulligan, director.

RUSSELL METTY, ASC, "Touch of Mink" (P'Vision & Color; Granley Prods.) with Cary Grant and Doris Day. Delbert Mann, director.

ELLIS THACKERY, ASC, BENJ. KLINE, ASC, "Thriller"*.

WILLIAM WHITLEY, ASC, "Holiday Lodge"*.

JACK MACKENZIE, ASC, "Ichabod and Me"*.

NEAL BECKNER, "Bob Cummings Show"*.

JOHN WARREN, ASC, JOHN RUSSELL, ASC, "Alcoa Theatre"*.

RAY FLIN, "Tall Man"*.

JOHN WARREN, ASC, ELLIS THACKERY, ASC, "Wells Fargo"*.

WALTER STRENGE, ASC, "Wagon Train"*
RAY RENNAHAN, ASC, "Laramie"*

CLIFFORD STINE, ASC, "The Ugly American" (Universal International; shooting in Thailand) with Marlon Brando and Eiji Okada. George Englund, producer-director.

JOHN RUSSELL, ASC, JOHN WARREN, ASC, "Alferd Hitchcock Presents"*.

BENJ. KLINE, ASC, DALE DEVERMAN, "87th Precinct"*.

JOHN RUSSELL, ASC, NEAL BECKNER, "Bachelor Father"*

ELLIS THACKERY, ASC, "General Electric Theatre"*.

DALE DEVERMAN, BENJ. KLINE, ASC, "Checkmate"*.

MACK STENGLER, ASC, "Leave It to Beaver"*.

ROBERT GOUGH, "Frontier Circus"*.

TWENTIETH CENTURY-FOX

JEAN BOURGOIN, "Gigot" (Eastman color; Seven Arts Prod.; shooting in Paris) with Jackie Gleason and Katherine Kath. Gene Kelly, director.

ARTHUR IBBETSON, "The Inspector" (Red Lion Films; shooting in London) with Stephen Boyd and Dolores Hart. Philip Dunne, director.

WILLIAM CLOTHIER, "The Comancheros" with John Wayne and Stuart Whitman. Michael Curtiz, director.

OZZIE MORRIS, "Satan Never Sleeps" (Leo McCarey Prod.; shooting in England) with William Holden and Clifton Webb. Leo McCarey, producer-director.

KENNETH PEACH, ASC, "Follow the Sun"*

LLOYD AHERN, ASC, "Adventures in Paradise"*

LEON SHAMROY, ASC, "Tender is the Night" (C'Scope & DeLuxe color; shooting in France) with Jennifer Jones and Jason Robards, Jr. Henry King, director.

KENNETH PEACH, ASC, "Follow the Sun"*.

WALT DISNEY STUDIOS

EDWARD COLEMAN, ASC, "Big Red" with Walter Pidgeon and Gilles Payant. Norman Tokar, director.

WARNER BROS.

FRANK CARSON, "Room for One More"*.

BURT GLENNON, "Lawman"*.

RALPH WOOLSEY, ASC, ROBERT HOFFMAN, JACK MARQUETTE, LEWIS JENNINGS, "77 Sunset Strip"*.

HAROLD STINE, ASC, LEWIS JENNINGS, "Maverick"*.

J. PEVERELL MARLEY, ASC, ROBERT TOBEY, ASC, "Cheyenne"*.

RALPH WOOLSEY, ASC, ROBERT HOFFMAN, J. PEVERELL MARLEY, ASC, ROBERT TOBEY, ASC, LEWIS JENNINGS, HAROLD STINE, ASC, "Surfside 6"*.

Continued on Page 568

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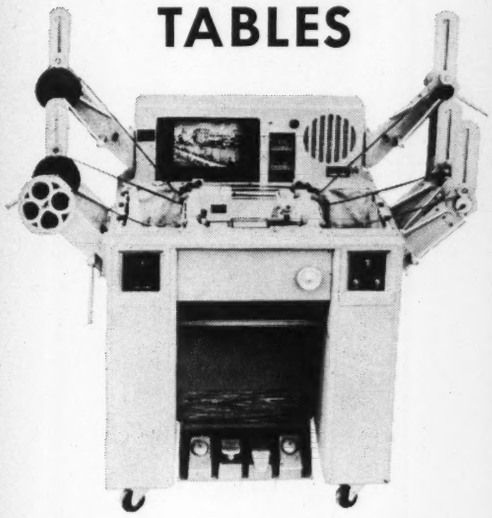

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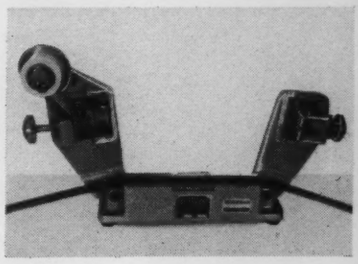

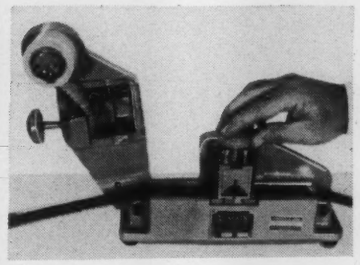

The cutting arm, shown in operating position, is used by pressing the chrome button for cutting both sides of the film simultaneously. The film, of course, has been registered on pins in the horizontal channel. The cutting blade is easily replaced when necessary.

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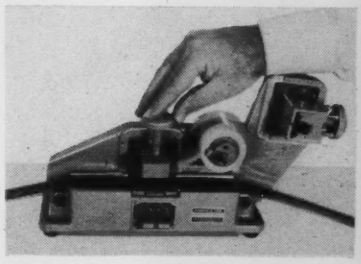

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- ☐ 66 ft. rolls — transparent 35mm (T-35) at $11.00
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Bolt a Bolex 16mm camera to a freight car ready to bump?

Research engineers at ACF Industries, Berwick, Pa., devised such a test to measure impact and called their Photo Department. ACF photographers, who devote a majority of their time to taking research shots, thought the request outlandish. "Precision cameras are simply not built with this kind of usage in mind," they argued. But the engineers said it was necessary if the test was to succeed and considered the camera expendable. The 16mm Bolex was bolted to the freight car and . . . WHAM! The car was bumped against another freight car . . .

The 16mm Bolex recorded every jarring frame of the collision and came away good as new!

Another exacting assignment for Bolex was to help measure impact on ACF's retractable hitches for truck trailers riding piggyback on flatcars. Through analysis of the Bolex films, engineers could see in detail how the springing arrangement responded to loads.

As you can see, Bolex equipment gets plenty of rough use at ACF. Two Bolex 16mm cameras—with a variety of Switar and Yvar lenses—are mainstays. Neither Bolex, one of them 12 years old, has ever given a speck of trouble.

ACF photographers use Bolex because it is rugged, dependable and offers lightweight compactness and sharp picture quality.

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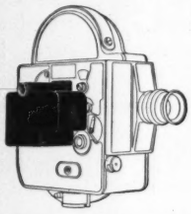
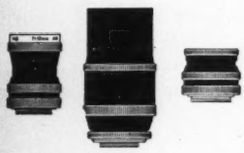
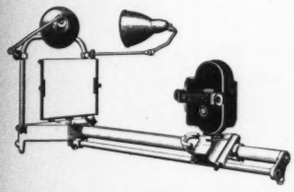


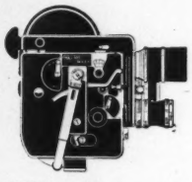
Bolex Unimotor: *Electric motor drives camera through full roll of film at constant speed. Batteries or AC current. $89.50.*



Precision-Ground Lenses: *Switar 10mm f/1.6 extreme wide angle, $149.50; Switar 25mm f/1.4 normal lens, $168.00; Switar 75mm f/1.9 extra-fast telephoto, $145.00.*



Bolex 16mm Super Titler: *Basic Kit—optical bench, main frame, two reflectors, title frame and sliding cradle—$180.50.*



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BOLEX

Q & A Technical Questions and Answers

Q.—*In what way does the recently-announced Model M Arriflex 16 camera differ from the model that preceded it? R. L., Portland, Oregon.*

A.—The new Model "M" has been designed to provide facilities not available on the earlier model which, however, still continues in production. New features exclusive to the Model "M" camera include 1) provision for using magazines of 200-ft., 400-ft., and 1200-ft. capacity, with corresponding interchangeable blimp tops; 2) a built-in pulse generator that produces a frequency signal that is recorded on tape simultaneously with the picture sound track, when using a suitably modified tape recorder; 3) provision for mounting optional automatic slating and cueing device; 4) transfer of feed and takeup sprockets from camera chamber to magazine for simpler film loading; and 5) hinged lids on the 200-ft. and 400-ft. magazines and the main camera door.

Traditional Arriflex features—such as full-fitting register pin and reflex shutter—are retained in the new Model "M" Arriflex.

Q.—*I wish to photograph in miniature the explosion and sinking of a scale model wooden ship. How can I produce the explosion—with flame and smoke resulting? Nothing else will be in the scene except the ship and the water.—H. A. E., New York, N. Y.*

A.—It is difficult to give you a specific answer without knowing the size of the model ship. This information is important because it determines the kind and amount of explosive to use as well as the fps speed of the camera when photographing the effect.

If the ship model is small, a small quantity of gun powder (from a firecracker or shotgun shell) can be used to produce the effect of explosion and flame. If any part or all of the ship is to disintegrate as a result of the explosion, some type of explosive should be used—usually in addition to the gunpowder that produces the visible flash. Large size firecrackers have been used for this, which entails rigging up a length of fuse to a point out of camera range where it may be ignited. In such operations, extreme caution must be constantly exercised!

Because miniaturized action must be presented in slow motion to give it a semblance of reality, it is necessary to shoot such effects scenes with the camera speed increased above the standard 16 or 24 frames per second. Just how much is something that Hollywood studio experts have determined by trial and error and for which there are no set rules because invariably each effects set-up is different.

As pointed out in the *American Cinematographer Manual* (page 418) "The number of frames per second exposure necessary for filming miniatures must be determined by trial and error . . . Camera speed depends on subject matter, speed (rate of travel or movement), and the direction of movement in relation to camera position and the scale of the miniature or model. Generally speaking, in cases of miniaturization, the camera speed is *increased*. In cases of magnification the camera speed is decreased." ■

BOOKS, CATALOGUES & BROCHURES

Available From Equipment Manufacturers

Equipment Rentals

A 12-page equipment rental catalog and price list schedule listing all the motion picture cameras and accessory equipment available through Camera Service Center is available by writing the company at 333 West 52nd Street, New York 19, N. Y.

Densitometer Bulletin

Westrex densitometers for density measurements of color and black-and-white positive and negative motion picture film and optical sound tracks are described in a new brochure available from the Westrex Recording Equipment division of Litton Systems, 335 No. Maple Drive, Beverly Hills, Calif.

Photos, drawings, charts and a complete description of densitometer operation are included in the six-page bulletin.

•

Lighting Cable Brochure

A four-page brochure illustrating and describing the company's line of custom power cables for use with Colortran converters and lights is announced by Natural Lighting Corp., 630 So. Flower St., Burbank, Calif. Included also in the brochure is technical data on main feeder cables, converter supply cables, light distribution cables, and light extension cords. Full specifications are given as to material used, receptacle terminations, capacity in amps., etc. All the cables and connectors catalogued are standard 3-wire type and thus can be used with equipment other than Colortran.

•

Gevaert Film Data

A technical folder describing the complete characteristics of Gevaert 16mm and 35mm professional motion picture films is available free from The Gevaert Company of America, Inc., 321 West 54th Street, New York 19, N. Y. Included is exposure information, applicability of each film, footage numbering and other details.

•

Video Tape Editing Data

Techniques Of Editing Video Tape is title of 28-page, 8½"x11" booklet which illustrates and describes how to build shows from tapes, locate splicing points, and create special effects. Published by Minnesota Mining and Manufacturing Company as a service to the television industry, booklet holds much of interest for technicians and producers of video tape commercials. Copies are free. Write 3M Company, Dept. E1-18, St. Paul, Minn.

•

Lab Price List

A complete price list of its services plus an illustrated brochure describing same is available from Hollywood Film Enterprises, Inc., 6060 Sunset Blvd., Hollywood 28, Calif.

•

Note: *All of the literature described above is free. Write direct to the companies mentioned — not to American Cinematographer magazine.—Editor.*

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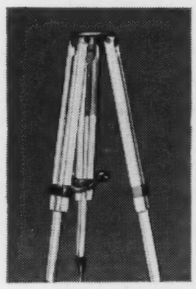

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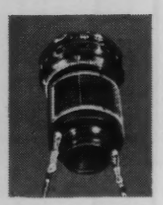

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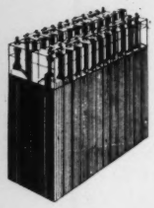

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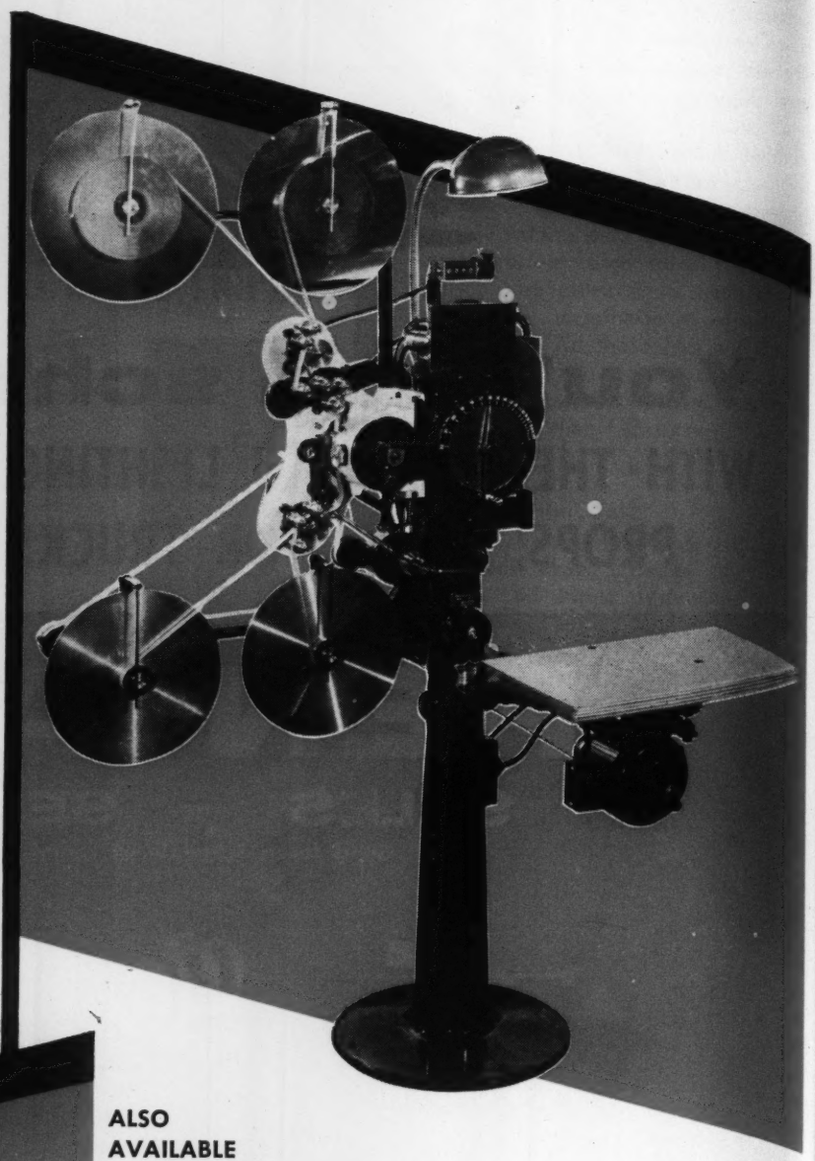

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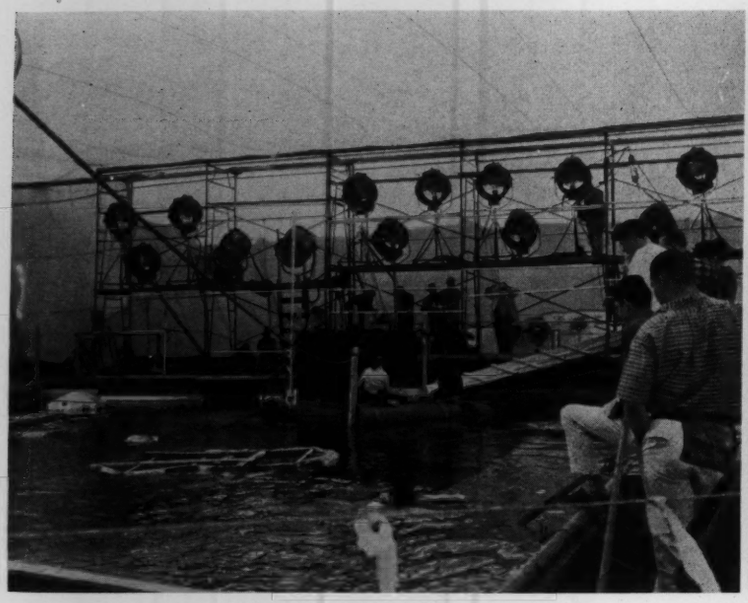

FIG. 1—THE "TANK" ON THE back lot at 20th Century-Fox studio, Hollywood, where much of the underwater action for "Voyage to the Bottom of the Sea" was shot. To provide illumination that would penetrate depths of water, huge Brutes were mounted on parallel in background.

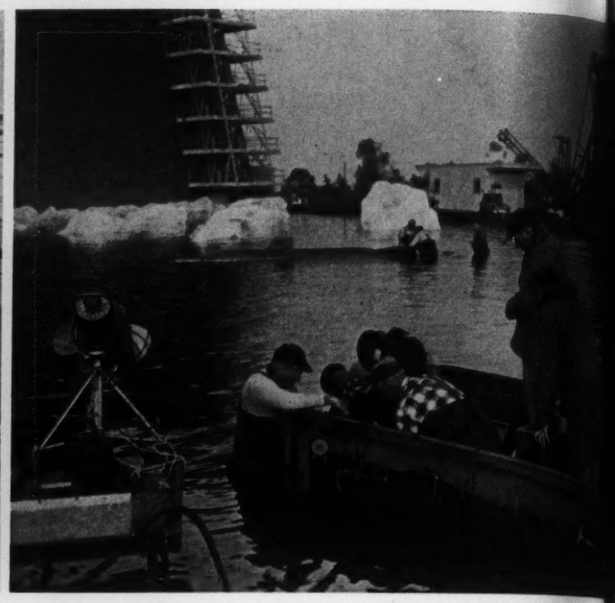

FIG. 2—CAMERA TECHNICIANS prepare Fox CinemaScope camera for a surface shot of submarine miniature, which other technicians are preparing for voyage among the artificial and miniaturized icebergs in background.

Producing The Special Photographic Effects For "Voyage To The Bottom Of The Sea"

By HERB A. LIGHTMAN

ONE OF THE LEAST PUBLICIZED but a most important department of any major motion picture studio is that responsible for special photographic effects in a production. This department functions 52 weeks a year, yet much of its effort is seldom noticeable to theatre audiences viewing the studio's pictures. For almost every feature production today includes some important contribution by the special photographic effects department.

Now and then a picture is made which is predominantly an effects picture in which the department's contribution is extensive. An example is the recent 20th Century-Fox production, "Voyage To The Bottom Of The Sea." A brief outline of the story will indicate how importantly special effects contributed to this picture—indeed, made the picture possible.

The story concerns a Navy Admiral who is taking a gigantic nuclear-powered submarine-of-the future (which he designed and built for the Bureau of Marine Exploration, U S. Department of Science) on its maiden voyage beneath the Polar ice cap. The sub is cruising easily beneath the ice when suddenly huge ice boulders come crashing down upon the vessel from above. The craft immediately surfaces where it is discovered that the entire sky is on fire. The temperature has zoomed to 135 degrees and everywhere ice is melting at a tremendous rate.

Contacting Washington by radio, the Admiral is informed that the Van Allen Belt of Radiation, which is said to surround the earth, is on fire. The Admiral is urged to proceed immediately to New York to attend a United Nations' conference to devise ways and means of saving the world from the holocaust.

As the sub proceeds under forced draft toward the east coast, the Admiral works around the clock in search of an answer to the problem. Ultimately he reaches the conclusion that the world-wide fire can be extinguished by launching into a certain orbit and at a pre-determined time, one of his craft's Polaris-type missiles from the Marianas Trench beneath the sea.

FIG 3—BILL ABBOTT, ASC (left), 20th's special photographic effects expert, and director Irwin Allen watch through porthole of steel diving bell as underwater scene is prepared for action, which will be photographed by the tarp-covered camera at Abbot's right.

At the United Nations conference the Admiral outlines his plan, which is voted down. He stalks from the conference room, re-boards his submarine and heads for the Marianas. Enroute, he vainly attempts to contact the President for permission to proceed with his plan. But the burning radiation belt has now blacked out all means of radio communication. An attempt to tap the Rio-to-London undersea cable also fails.

The Admiral than decides to proceed on his own responsibility, and from this point on the voyage of the sub becomes a sea-chase during which the craft seemingly is assailed by every conceivable obstacle to frustrate its mission. In addition, there is sabotage and a lot of human skullduggery that takes place aboard the sleek and handsome vessel, climaxed by a hair-raising episode when the submarine runs directly into a mine field presumably set during World War II. To cut loose a threatening mine, two men are sent out in a miniature sub released from the larger craft, but this is blown to bits when it accidentally contacts one of the mines.

Then, as if one undersea hazard weren't enough, the sub is attacked by a giant octopus which wraps its enormous tentacles around the craft in an effort to crush it. Despite all the obstacles, however, the submarine arrives at the Marianas Trench just in time to launch the fire-extinguishing missile at the proper moment to be effective The missile explodes, the flames in the sky subside, and the submarine begins its journey back to badly scorched civilization.

The special photographic effects for this picture begin to appear immediately after the credit titles unfold. The first scene is that of a Polar lagoon surrounded by icebergs. (You can see the miniaturized 'bergs and the whole scene in reduced scale in Fig. 2.) Suddenly the polar sea is seen to boil up and a futuristic submarine resembling in contour a shovel-nosed shark virtually leaps out of the water diagonally and comes to a halt on the surface.

To produce this action, 20th Century-Fox's Special Effects Department, headed by veteran effects expert L. B. "Bill" Abbott, ASC, constructed a scale model submarine and launched it in the studio tank on the back lot. For the scene of the sub emerging dramatically from the depths of the sea, the craft was properly positioned below water at the right trajectory for the action. By means of a trip-release and a winch with a line on the tail of the sub, the craft's natural bouyancy was accelerated for the "jump-up" effect. Within the sub model itself high-pressure water hoses were connected to ballast portholes to produce, at the proper time, the effect of water ballast issuing forth as the craft surfaces. The addition of a detergent to the water created the desired effect of foaming turbulence.

The highly spectacular shot of the leaping submarine, which was thus produced—improbable though it may seem—duplicates an actual occurrence which producer-director Irwin Allen had previously witnessed in a motion picture of a series of tests of an actual nuclear submarine.

An effective scene early in the picture shows the submerged submarine moving in the dark waters

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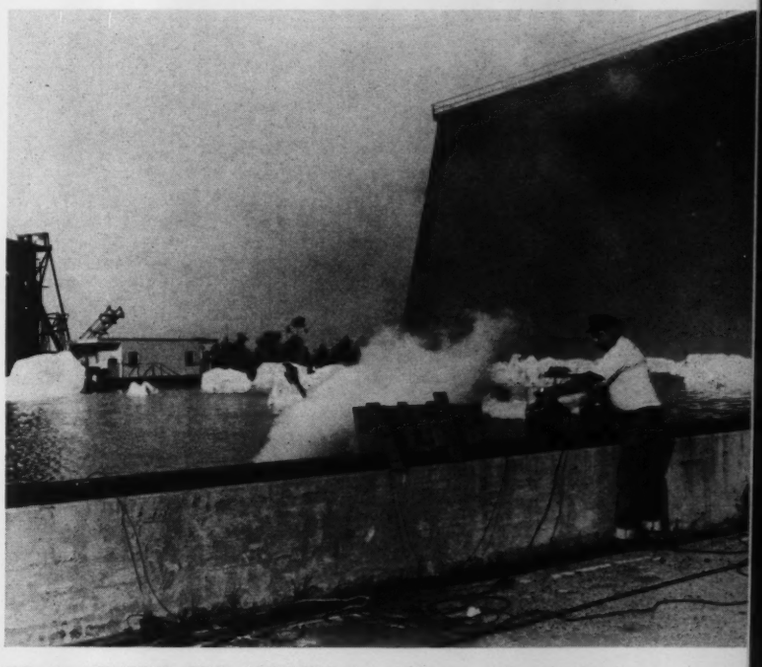


FIG. 4—UTILIZING TWO ARTIFICIAL fog-making machines, technician spreads realistic mist over surface of "sea" on which submarine action is to be staged for "Voyage to the Bottom of the Sea."

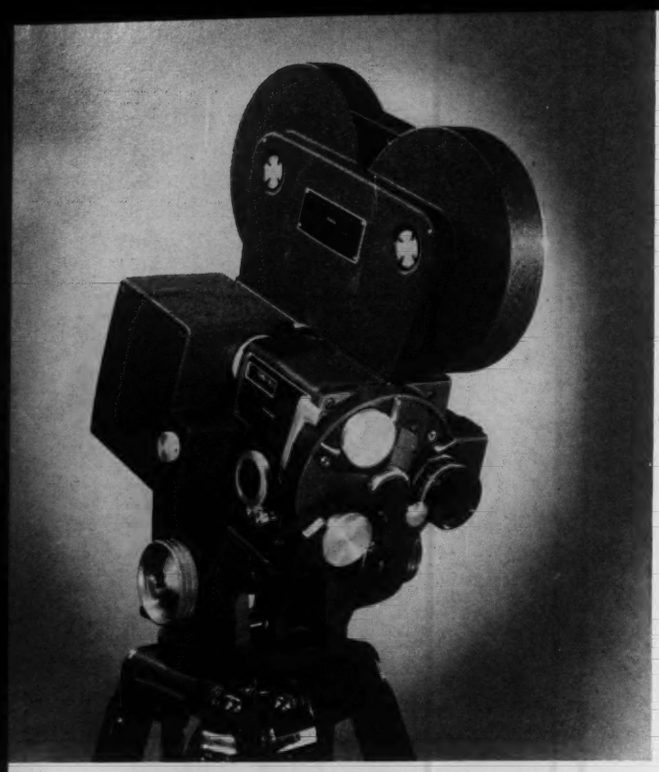


FIG. 1—HIGHLY PROFESSIONAL in appearance and possessing many innovations is Kodak's slick, new 16mm Reflex Special.

KODAK'S NEW REFLEX SPECIAL 16MM CAMERA

IF YOU WORK WITH 16mm cameras, you'll be interested in the slick new Kodak Reflex Special introduced last month by Eastman Kodak Company.

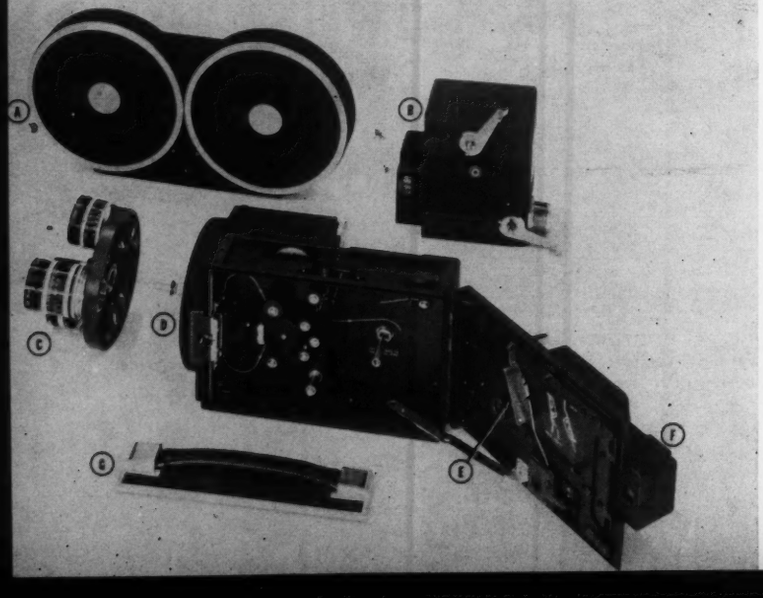
It is Kodak's first venture in producing a truly professional motion picture camera, and the Reflex Special's handsome appearance and functional design plus the enthusiasm with which it has been accepted wherever it has been shown, promises a great future for it.

The camera was in the planning stage for ten years before construction work on the prototype began. Essentially, the camera was planned to meet the requirements of cinematographers in television stations, TV newsreel cameramen, in-plant industrial film units, on-campus university cinema classes; also for non-theatrical film producers, producers of TV commercials, animated film production, documentary and speculative cinematographers working in the field, missile test center film units, race track film patrol, etc.

Cinematographers Queried for Ideas

In the beginning Kodak engineers queried cameramen in the above film production fields to determine what features and qualities they most desired in a 16mm camera. Maintenance and repair men also contributed important ideas. In short, the consensus indicated the new camera must be a versatile instrument which would perform superbly as a matter of routine and without need for temperamental adjustments—a truly professional camera which can be kept in top condition by the camera operator himself. Two other suggestions which impressed Kodak engineers were: "Make the camera completely flexible in the matter of film capacity so that the one camera can accommodate film loads from 100 up to 1200 feet simply by interchanging magazines," and "The camera should be readily adaptable to single-system magnetic sound recording, using pre-striped film." These features have been incorporated in the Kodak Reflex Special.

FIG. 2—The Reflex Special dismantled, except for the film transport movement, which also is removable. The various components are identified and described in the text.



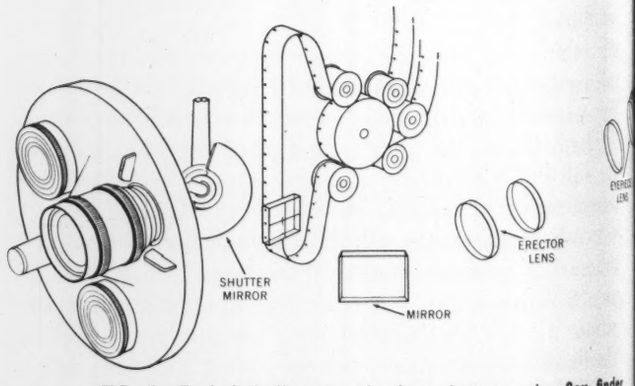


FIG. 3—Exploded diagram of mirror-shutter and reflex finder system of the Reflex Special, which permits cinematographer to view scene as it is being recorded on the film.

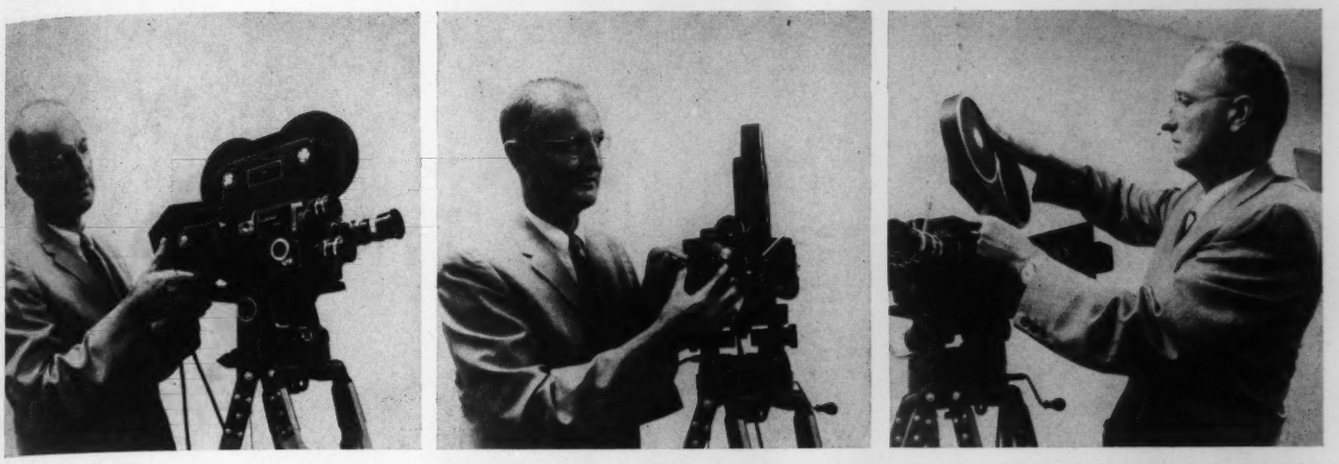


FIG. 4—Dr. Norwood Simmons, Manager of West Coast Division of Eastman Kodak Motion Picture Film Dept., demonstrates three salient features of the Kodak Reflex Special. In the first photo, easy removal of the 24 fps motor is demonstrated; the instant release lock of the 3-lens turret is shown in the center photo; while the ease with which the 400-foot film magazine may be mounted or demounted is demonstrated in third photo. Demonstrations took place on opening day of SPIE's Technical Symposium last month.

The Reflex Special takes its name from the reflex finder which enables the operator to view the image photographed through the taking lens while the camera is in operation. The camera's viewing system, Kodak points out, is the first in its field to feature reflex viewing while retaining a full-scale variable shutter. A mirrored surface on the shutter reflects the image to a ground glass within the aperture, shown at X in Fig. 6. When the camera door is closed, the finder tube (F in Fig. 2) is in position to pick up and transmit the image to the eye of the operator. The schematic drawing (Fig. 3) illustrates the entire mechanical and optical system of the reflex viewer.

An outstanding feature of this viewfinder, and one which every professional cameraman will appreciate, is its ability to present the focus point on the ground glass so that it corresponds exactly with that in the film plane. Thus, by adjusting the optical viewfinder to bring an image into focus, the image on the film itself will be sharp.

Finder Eyepiece Is Adjustable

The reflex viewfinder eyepiece lens is also adjustable at the discretion of the operator to accommodate the focusing ability of different eyes. A magnification of the image of 10-to-1 is provided, and this can be increased to 20-to-1 for critical focusing—ideal for certain industrial film production where very small objects demand critically sharp focus.

For those cameramen who like to work with a Mitchell-type finder, there is provision for mounting one adjacent to the reflex finder tube. Also, to prevent light leaking through the reflex finder system to the film, when the operator is not using the eyepiece, there is a lever-operated shutter in the finder tube that blocks light entering at the eyepiece.

The Reflex Special weighs about 24 pounds. It is

Continued on Page 564

FIG. 5—Rear view of camera. Arrow points to remote stop-start switch, which features a neon light that indicates when power is being delivered to camera motor.

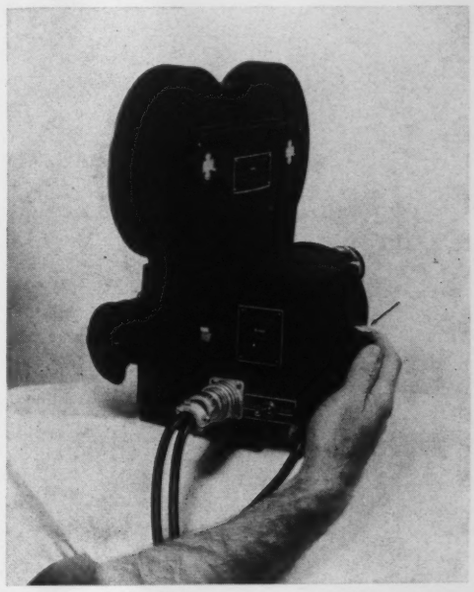
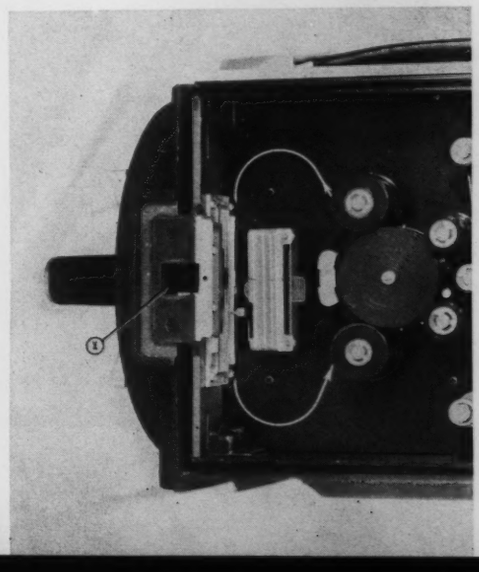
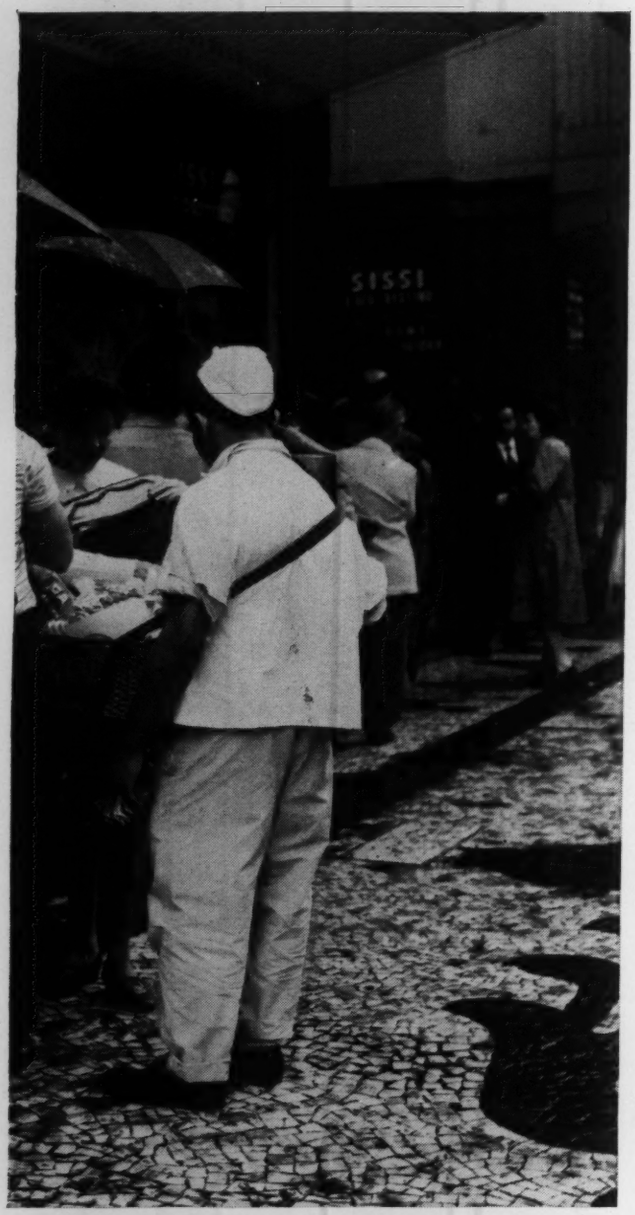


FIG. 6—Closeup of gate assembly and pulldown mechanism of the Kodak Reflex Special 16mm camera. Arrow X points to recessed groundglass of the reflex through-the-lens viewing system.





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SORVETES
VITAMINAS
PIRKTI

TV NEWSREEL photographer Wade Bingham carefully checks the light with an incident-light meter before rolling the camera for scene on Chinese junk in Hong Kong harbor for a CBS documentary. Subject is CBS Newsman Peter Kalischer.

Bingham's Beat

Twice honored for his TV newsreel photography, Wade Bingham covers the Asiatic-Pacific newsbeat with his cameras for CBS-TV.

By CLIFFORD V. HARRINGTON

WADE BINGHAM IS CBS-TV'S "Man in Asia." Bingham's beat, probably the world's largest for a news cameraman, stretches from India to Australia and north to Korea and Japan. Home base is the Foreign Correspondents' Club in Tokyo.

Working in close liaison with the home office, he's kept active with assignments that range from a one-minute clip on some pertinent event or subject to producing a complete 60-minute documentary with sound. Because of the peculiar demands of television, the product of Bingham's efforts is considerably more than the straightforward cinematography that characterized the work of the newsreel cameraman of yesteryear. TV newsreel footage invariably requires sound recorded on the spot, and this, plus TV's demand for good lighting, adds to Bingham's working burden in that he must travel and work with more than simply a camera and film.

It is not unusual to find Bingham setting out on an assignment accompanied by a half-ton of photographic, sound recording and lighting equipment, and riding herd on a crew of six or eight technicians. This occurred re-

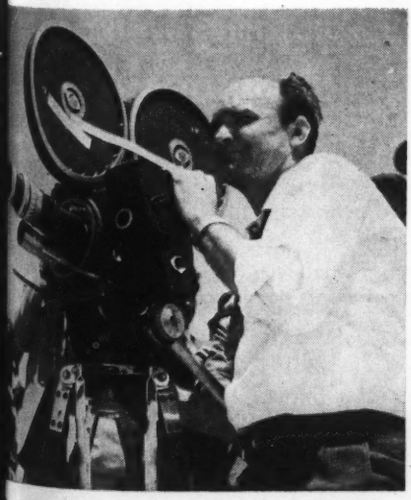
cently when he embarked on his biggest production of the year—a documentary chronicling the renowned achievements of Dr. Gordon Seagrave, famous Burma Surgeon.

The footage he shot on this subject was originally intended for a half-hour segment of CBS' "The Twentieth Century" TV program; but exceptional quality of the coverage plus the importance of the subject matter resulted in CBS releasing it, following its original presentation, as a full-hour presentation on the Armstrong Circle Theatre program late last June.

Bingham left Tokyo on this film junket with fifty pieces of movie equipment and a staff of six men; later his staff was augmented with several Burmese technicians. David Scott from New York was along to handle the sound. The size of this production staff and its equipment posed its first problem at the Rangoon airport.

"We had so much equipment and so many people," Bingham said, "that each man had to be weighed and corresponding gas siphoned from the plane's supply to cut down the excess weight. I stood by to make sure that every drop of gasoline possible was left in the tanks for our flight over the jungle."

Continued on Page 566



uses Auricon Pro-1200 camera with extreme tele- to shoot a Far East news event. He also uses eras in his news and documentary film work— Mitchell shown in photo on opposite page.

LINING UP AN INTERIOR SHOT — Cinematographer Ted Saizis (right) prepares to line up a scene with narrator Doug Edwards while brother Vincent, behind the Mitchell, sets the camera. Production is "Temperatures Made To Order," for the Harrison Radiator Company.

Shooting A "Problem" Picture

There are few problems in cinematography that imagination, experience and skill cannot overcome.

By FRED WOODRESS

THE WORDS "problem" and "challenge" frequently are used when the photography of a motion picture is described—not because cinematography is necessarily fraught with difficulties, but because each new assignment invariably is different in topic, locale, or mood, or, if it is a commercial subject, in the pictorial concept.

Unusual locations can pose one or more problems in lighting; and presenting a product pictorially so it will appear on the screen most advantageously often becomes a problem until careful study and trial-and-error shooting renders a solution. On almost every assignment the cinematographer invariably comes up against some new or unusual situation, but ultimately he solves it. And the way he does it usually is of interest to other cameramen.

"Temperatures Made To Order," produced in 16mm color for the Harrison Radiator Division of General Motors, presented many problems for cameramen Ted and Vincent Saizis. One was a scene which called for a closeup showing how an automobile radiator thermostat opens when a certain temperature level is reached. Here, the company's engineers came to the aid of the

Continued on Page 548

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IMPORTANCE OF CAMERA POINT-OF-VIEW

How the camera angle and the lens used can influence the impact of your photography.

By JOSEPH HENRY

ONE OF THE IMPORTANT THINGS a professional motion picture photographer learns is the wide range of viewpoint he can give a scene, depending on the lens he uses and the location and elevation which he gives his camera. When we normally look at any scene or vista, the scope of our vision is wide, but when a motion picture camera lens is focused on it, the aspect and dimension of the scene is affected by the focal length of the lens and the angle of the camera. Depending upon its relation to a scene and its action, the camera is capable of conveying many different impressions; here the cinematographer's feel for composition and art plus the script's action requirements will determine the ultimate pictorial result.

The result thus achieved is what distinguishes one cameraman from another, for knowing the importance of point of view and how to apply it to a given situation greatly influences audience reaction to the scene if not to the entire picture.

Proper application of point of view, or more correctly, choice of camera angle, enables the cinematographer to influence audience reaction. It is what is termed "style" or "approach" in cinematography and is applicable to the photography of almost any subject. While the cinematographer sees the entire scene or situation before him, ultimately the picture's audience will see only as much of it as he frames in the camera finder—see it in terms of the perspective which the camera angle used has created.

Since point-of-view is so important, then, it is to the cameraman's advantage to sit down and do a bit of planning before he starts to shoot. He should decide just what mood he wishes to establish, what camera angles it will require, and how the camera can be used to best complement the action. This planning will pay its way many times over, for it does away with the costly hit-and-miss shooting which we see so often. It will give the screen presentation a more professional finish, and—most important of all—it will tend to draw a more appreciative reaction from the audience.

Let us therefore review some of the basic principles of camera viewpoint and discuss some of the ways in which they influence an audience's impression of a particular scene.

The High Angle Shot: When we look down at anything, we automatically become (in a psychological sense) superior to whatever we are viewing. If we look down from a height at a scene even as vast as the Grand Canyon, we will still experience a sense of power that comes from having the whole thing spread out before us. Subconsciously we feel that it belongs to us and that we are able to command it from our exalted position. This probably explains why political dictators invariably build their retreats on mountain-tops, and feel most

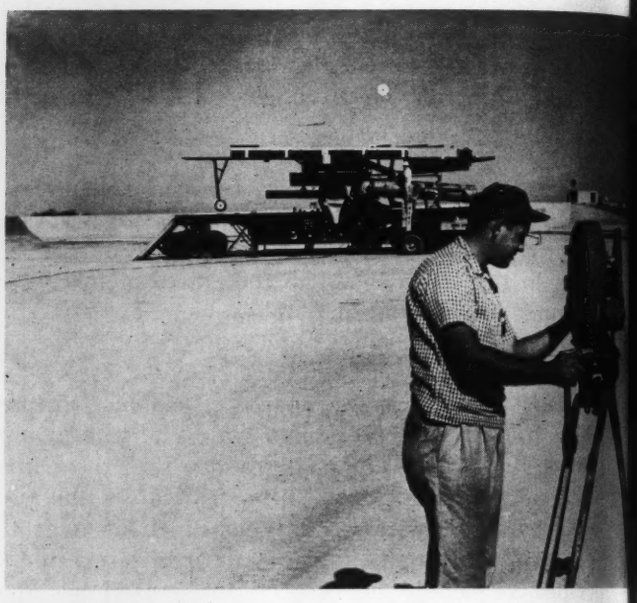
Continued on Page 550

FOR A DRAMATIC SHOT, this WPIX news cameraman (unidentified) took to the rafters. Knowing when to use other than normal camera angles is important to cinematographers in all fields of motion picture making.

UTILIZING THE thrust of its own engine plus the kick of a 130,000 pound-thrust rocket, a combat-loaded Super Sabre roars off a mobile launcher without ever touching a runway. In developing the technique, engineers utilized scores of instrumentation cameras to record test performances and supply critical data. Pictures at right show some of this activity performed by the Motion Picture Unit of North American Aviation, Inc.

Sharp "Eyes" F

By LEIGH ALLEN



THESE PHOTOS depict North American Aviation's film unit personnel readying cameras for recording an F-100 Dummy Zero launch test in which a dummy plane subs for the real thing. Ed Spurgeon, in foreground, is checking a Fastax high-speed camera with 400-foot film load.

MOTION PICTURE CAMERAS of various types and design have become important tools of engineers, designers and others associated with the development of aircraft, missiles and rockets. Some of these are known as "instrumentation" cameras, and they also produce photographic records of events in a sequence of exposures on a single strip of film.

When a test flight or other experiment is to be made, there's nothing like a motion camera for recording the performance on film, so that it may be studied repeatedly and more leisurely than is possible in observing the actual test. Indeed, it is humanly impossible for even the most experienced observer to see every detail of a fast-moving event that takes place in the space of very few seconds.

During its development stages, the most comprehensive visual study of one of the most important jet aircraft launching achievements of the Air Force was made possible through a photographic set-up in which a number of motion picture cameras of different types were strategically placed at the site to record the test for engineers.

The aircraft launching system then under study is the now established ZEL system of the U.S. Air Force in which a combat-loaded Super Saber jet fighter is launched into flight without ever touching

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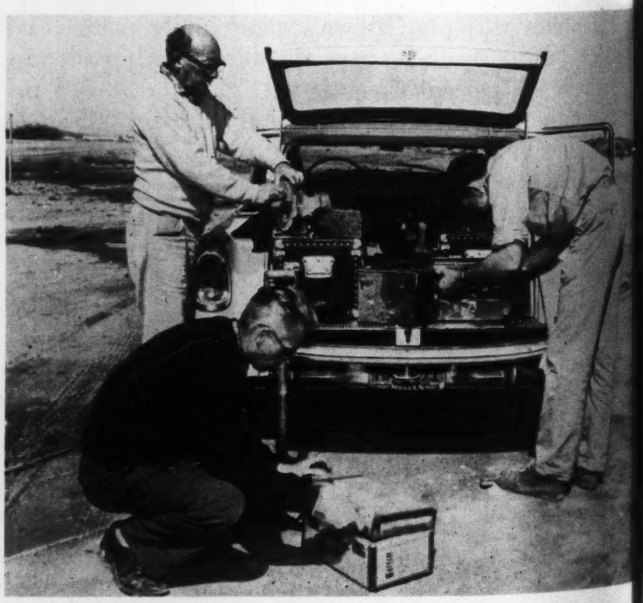
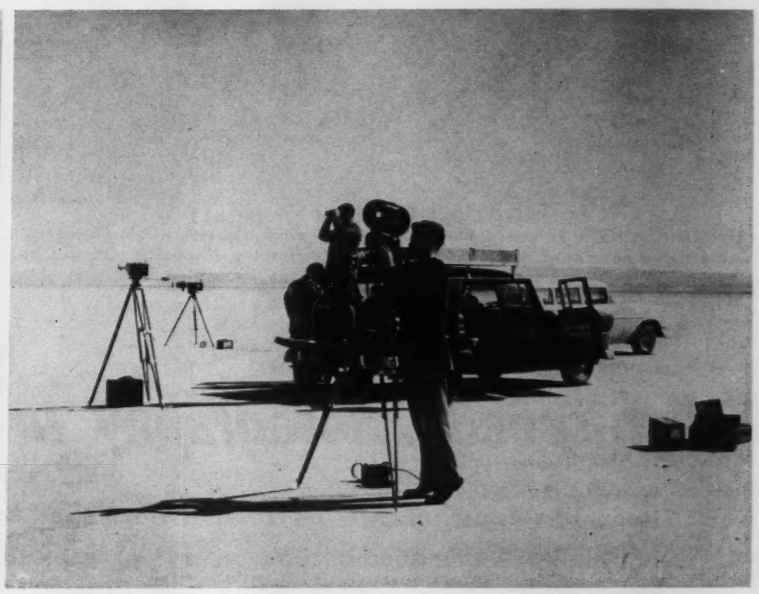


A VARIETY OF CAMERAS are used in recording the tests and each has its special purpose. Some operate at 24 fps while others are specifically designed for ultra-high-speed recording. Here North American Aviation technicians prepare cameras for action.

Aircraft Development Engineers

Exceeding the ability of the human eye, motion picture and instrumentation cameras record split-second variables in jet test performances.

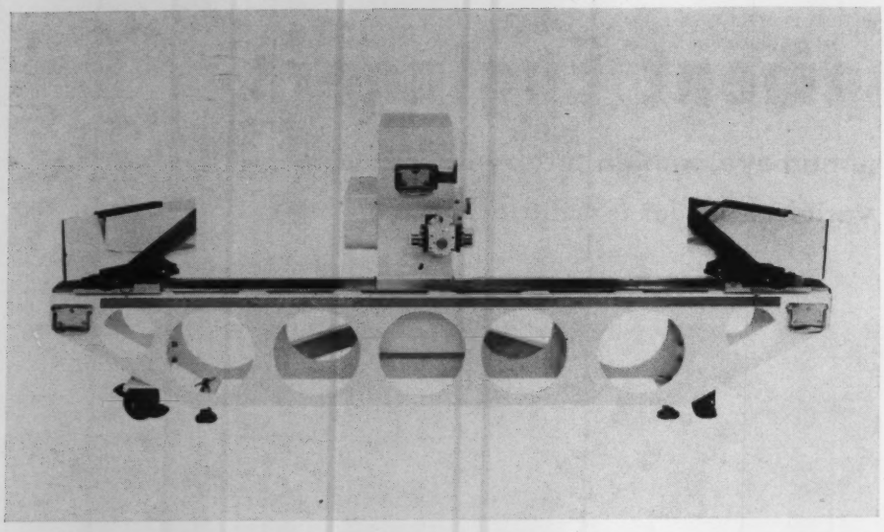
A MAGNIFAX HIGH-SPEED camera is mounted on a steel parallel for a head-on shot of the dummy (on launching rig in background) by technicians Eugene Beagin and Ed Spurgeon. Cameras are remote-controlled. Wiring is carefully checked to avoid failures.



IN ADDITION TO the high-speed camera, standard 16mm cameras operating at standard SOF speed were also set up in the area and focused on the dummy craft. Here John deLong lines up an Arriflex 16, which is mounted with telephoto lenses, as are the others seen in background at left.

AWAITING THE ZERO HOUR, three motion picture cameras—all different —and their respective cameramen prepare to cover a Dummy Zero launch test in a Southwest desert area. All cameras are electric motor driven from power packs and started and stopped by remote control.

CAMERA CAR WITH shooting platform on top provides vantage point for cameraman Oliver Porter, shown here lining up an Arirflex 16 to track the ZEL launched F-100 dummy craft. This camera set-up has advantages in that it may be quickly shifted from one location to another. (All photos by North American Aviation, Inc.)



BENSON-LEHNER'S Stereoflex high-speed rotary prism camera, which photographs subjects in full scale stereo pairs on a single strip of specially-perforated 35mm film. Camera, in center, has lenses mounted at right angles to pick up images reflected by angled mirrors at either side, which are adjustable for a wide range of interaxial distances.

High-speed Photography In 3-D

Stereo photo-instrumentation camera developed to provide high-speed motion picture records of explosive detonations in 3-D, may have other applications.

By GUY HEARON
Vice-president, Benson-Lehner Corp.

PHOTO INSTRUMENTATION is a field in which things happen in all directions.

Yet all of the tools offered to photo instrumentation engineers until now have lacked the ability to make high speed studies of our problems in their full dimension. Specifically, if you are looking at an operation with a two-dimensional camera, you have no depth perspective. Yet, in some cases, it is just as important to know what reactions take place immediately in front of and behind the point of observation as it is to be able to observe what goes on at the sides of your field of view.

Photo Instrumentation engineers at the United States Naval Weapons Laboratory, Dahlgren, Virginia, are the first in the country to acquire a 3-D camera of this type for research photography. This group wrote the specifications for which Benson-Lehner developed the Stereoflex Model A camera. This unit is the first high-speed rotary prism motion picture camera which photographs its subjects in full-scale stereo pairs.

The real significance of the Stereoflex lies in the increased observation capability which is gained by adding a third photographic dimension. High-speed photography basically is a method of reducing data for slow-speed visual correlation. Therefore, the closer we can dovetail our photo instrumentation end product with human optics, the more understanding we will generate and the more useful the pictures will be.

Aids Studies of Explosives

The specific problem which led to the development of the Stereoflex offers a good illustration of the usefulness of three-dimensional techniques in our field. At Dahlgren, a series of studies were being made on explosive detonations. It was felt that these phenomena could be better observed and evaluated with three-dimensional presentations which would enable scientists to study shape and depth of explosive cycles in a series of single motion picture sequences.

Making this possible has required creation of and adherence to some important new performance standards in high speed photography. For example:

The Stereoflex exposes 35mm film at 15,000 frames per second.

Film Travels 127 mph.

The film is accelerated from a stationary position to 15,000 frames per second speed in from 0.5 and 0.6 seconds. Thus, the film goes from a standing start to a speed of 127 miles per hour in a fraction of a second.

Once the Stereoflex reaches its top running speed, the camera's synchronous motor drive maintains a uniform velocity. Most high-speed cameras use the bulk of their power to get up to top running speed. With its high acceleration capability, the Stereoflex now delivers an end product in which 80 per cent of the footage is exposed at optimum speed. In the past, this figure has been as low as 10 to 20 per cent.

With this longer, constant-speed running time, it becomes an easier and more natural process for observers to relate motion picture presentations to the actual timing sequence of the high speed studies.

The basic technique of the Stereoflex is to photograph two 16mm sequences on a single strip of 35mm film. The film used contains four rows of perforations with two rows running down the middle of the film, between the two 16mm images. The longitudinal perforations are on 8mm spacing (½ frame 16mm). The net effect is to provide maximum traction at the sprocket drive which pulls the film through the camera.

In operation, a 400-foot supply reel of this film is mounted in the upper portion of the camera housing. From there, it is threaded over a viscous-damped tension roller. As tension is applied, the roller travels downward and inward along a track toward the feed sprocket. The 400 feet of film and supply spool represents mass weighing approximately four pounds. In rapid acceleration, considerable tension is created. This tension must be kept under 65 or 70 pounds or the film will snap.

The driving capstan is directly behind the camera's rotary prism shutter. Sprockets on this capstan are set up

Continued on Page 546

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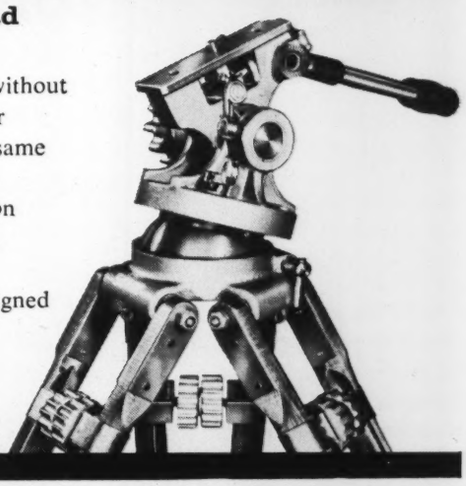

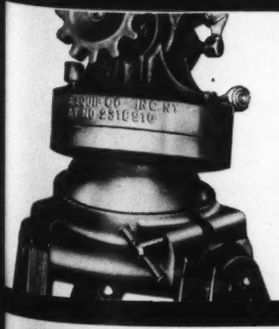

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HIGH-SPEED IN 3-D

Continued from Page 544

in four rows for maximum traction. Directly above the capstan is a neon timing light. This can be adjusted externally for operating speeds up to 1,000 frames per second. In operation, the timer records real time reference points on the film simultaneously with the picture. For takeup, the film is passed over a second tension roller and threaded onto a takeup reel.

With this arrangement, the Stereoflex is able to deliver more than 300 feet of film (out of each 400 foot roll) exposed at a constant speed of 187 feet per second. Proportionately, this represents a higher percentage of usable film footage than we have ever been able to develop with high-speed, rotary prism cameras.

At top speed, the sprocket drive rotates at 12,167 revolutions per minute. The sprocket is gear-connected to the 24-facet prism which rotates at 37,500 revolutions per minute at full speed.

The prism itself holds one of the important keys to the camera's feasibility. With its 24-facets, it resolves a half-frame 16mm image. The resulting image has an aspect ratio of 3-1. This image size is adequate in most situations in which the camera might be used.

Actually, use of the 24-facet prism was the most practical approach to achieving the 15,000 frame-per-second rate of film travel. Had a conventional, eight-facet prism been used, a 112,500 revolutions-per-minute speed would have been necessary. This would have required not only a larger surface area per facet but would have greatly increased the danger of the prism breaking during the initial shock of acceleration.

Prism Most Costly Element

The prism itself is one of the most critical and most expensive elements in the camera. Each pair of matched surfaces was ground parallel to ±.0003″. Concentricity of each flat surface is also within ±.0003″ from the center line. Flatness of each surface is within one fringe.

The entire film transport mechanism, including the prism, operates from a single drive source. This is a 208-volt AC synchronous motor with a DC excited field. In operation, input to this motor is stepped up to 280 volts to obtain a power output of 7.5 horsepower.

The capstan and the supply and takeup film spools are driven through an interchangeable belt-and-pulley arrangement. By changing belt and pulley sizes, the rate of film travel may be altered between 700 and 15,000 frames per second.

The film capstan is powered by a direct belt drive. Each film spool is controlled by a magnetic hysteresis clutch, which couples the spools to the camera's drive system. With the clutch fully engaged, the supply spool is driven at a speed of 7,000 revolutions per minute. Beyond that, the clutch overruns to a maximum spool speed of 14,300 revolutions per minute.

Clutching and Driving Action

This clutching and driving action of the spools is regulated by the film tension. A potentiometer, linked into each of the tension arms over which the film passes, controls the amount of current feeding the magnetic clutches. In this way, when film tension increases, the clutch action is decreased, permitting the spools to overrun. As momentum assumes a constant value, the film tension decreases and the clutching action is increased to prevent the possibility of slack in the film. When all of the film has run out, the entire drive system is halted automatically by a microswitch.

The optical system of this camera employs mirrors and objective lenses which are mounted perpendicular to the optical axis. This provides two important benefits in creating the stereo images:

1. First, the optical convergence of both lenses is controlled by means of a single set screw. With the lenses housed in one mount on a perpendicular plane, adjustment of the screw at the front of the mount moves the lenses in or out. This has the same effect as moving both lenses horizontally in a conventional stereo system.

2. The interaxial relationship of the stereo images can be controlled by positioning the mirrors along a perpendicular dovetail way. (See photo.) Depending on subject distance, the mirrors can be positioned up to six feet apart. They are adjusted with the aid of an engraved steel scale along the base of the camera mount. Scales are also provided to control the angle of incidence of each mirror.

The system uses front surface mirrors of ¾-inch glass. The heavy-weight glass provides stability in the mirrors, necessary because of the simplified, clamp-type holding bracket used.

Specifically, the mirrors were designed for expendability. When the camera is used to study the effects of explosives, the mirrors are positioned before holes cut into the walls of an experimental chamber. When a sequence is filmed, the resultant shock waves invariably "blow out" the mirrors. The mirror clamps are so designed that the shock is not transmitted to either the mount or the camera.

Within the lens mount of the Stereoflex, parrallel-mounted 1:1 optical relays set in a ruggedized assembly carry the image to the film. The assembly mount contains a port into which a boresighting tool can be inserted so the lenses may be individually focused. With the boresight locked into one of two positions set up for each lens system, both lenses are focused from the same side of the camera.

In operation, the camera bolts solidly to the mount, which also contains the dovetail way for the mirrors. The mount can be maneuvered into position on casters or carried by means of handles mounted on each side of the frame. Weight of the mount is approximately 170 pounds. The camera itself weighs 130 pounds. When the unit is set up for use it is positioned and leveled by means of screw-type jacks.

The control box through which the Stereoflex camera is operated provides a power switch, an operating switch and an indicator light which signals that power to the unit is turned on. Provision has also been made so that the camera can be activated by an electrical impulse from the system controlling the operation which is being studied.

Special Projector Required

Stereoflex films are shown by a specially-built projector which is supplied with the system. The projector uses an intermittent drive which engages all four rows of sprocket holes in the film. Projector operating speed is variable, up to a maximum of 20 frames per second. The film advance mechanism also provides forward, reverse or stop-motion operation.

The projector has a dual lamp and dual lens system, and the lenses can be adjusted to converge or superimpose images on the screen. Lamps up to 500

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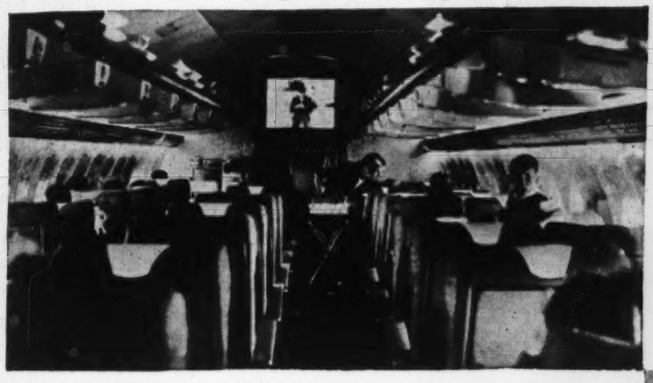

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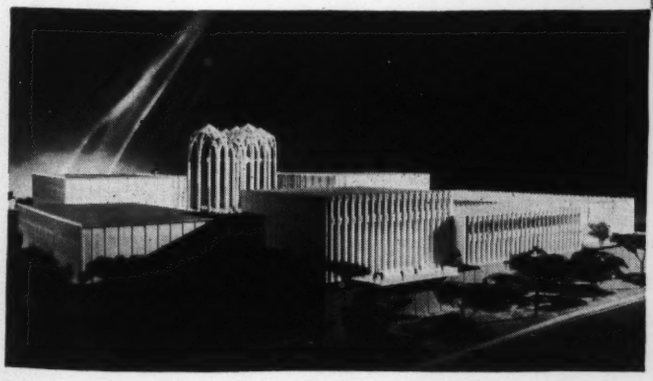

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watts may be used. Image brightness is specified at 17 foot-candles on a high-gain portable screen. Polaroid filters are mounted on the projection lenses and the fields of these filters are set at right angles. Viewers use eyeglasses correspondingly polarized.

Stereo image correlation throughout the system is adapted to the objective of the project. That is, the factor of optical convergence is tailored so that observers can achieve the best possible vantage point.

This ability to correlate observations to three dimensions while optimizing high speed camera performance is, in itself, a potential new working dimension for photo instrumentation engineers.

Obviously, it is too early yet to list a hard-and-fast field of applications for the Stereoflex. Rather, it appears that the capability for high-speed stereo studies has opened a new area in which photo instrumentation engineers can apply their talents and imaginations.

The foregoing is modified text of a paper prepared for delivery at the 1961 Technical Symposium of the Society of Photographic Instrumentation Engineers, August 7-11, 1961, Ambassador Hotel, Los Angeles. —*Editor.*

SHOOTING PROBLEM PICTURE

Continued from Page 539

Saizis and built a special plastic mount for the thermostat. Then, by inserting extremely small electric light bulbs inside the radiator and submerging them in the flow of water, it was possible to photograph what first appeared to be an impossible shot.

"Although this closeup required two days to shoot," said Ted, "it is on the screen only three seconds!"

Another difficult scene to photograph for this picture was that which shows how water flows inside the tubes of an automobile radiator. To enable the cameramen to accomplish this, Harrison engineers sawed a radiator in half to provide a cross-section view, then built special pumps to circulate the water in the radiator "on the half-shell." To provide the necessary illumination for this shot, a special electric bulb was made and inserted inside the radiator.

Since this industrial film was to be in color, color tests were made in advance. One interesting revelation was that painting the factory machinery orange and blue rendered the best

Acceptance of the MOVIOLA CRAB DOLLY for motion picture and television cameras is world wide as evidenced by unsolicited testimonials.

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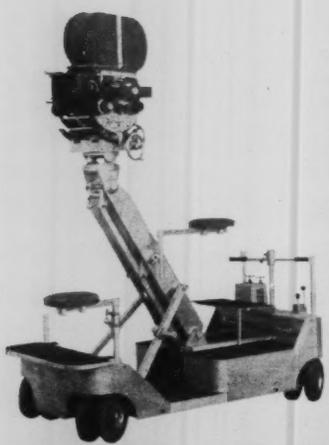

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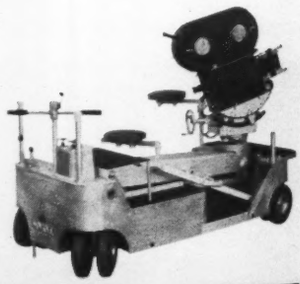

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Sound Equipment Checklist

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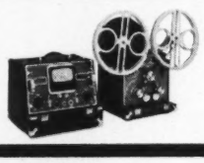
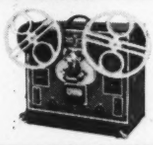
Nomad MARK 11	The 12-lb. featherweight Mark 11, a professional double-system recorder/reproducer is completely transistorized, self-contained, and highly reliable with maximum recording qualities and operating economy. Power consumption is only 20 watts. From $985.	X													X	X	
X-400	When lightweight portability is a **must** the 27 lb. X-400 Type 1 is the answer! Another reason so many producers choose this machine is that it is genuinely professional, and yet, surprisingly economical! From $985.		X			X	OPTIONAL	OPTIONAL	OPTIONAL						X	X	OPTIONAL
TYPE 1	 The Type 1 is a miniaturized version of the Type 5. Low power consumption and extreme portability has made this 39 lb. unit a popular selection for remote location production by leading professional motion picture studios. From $1430.		X	X		X	X	X	OPTIONAL		X				X	X	OPTIONAL
TYPE 15	 The X-400 Type 15 is designed for the man who wants everything in one case . . . playback amplifier, monitor speaker, footage counter and torque motors. You can be proud to have this machine represent you on any sound stage! From $1385.		X			X	X	X	X	X					X	X	OPTIONAL
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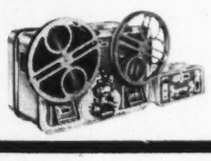
MARK 1X	 There is nothing on the market that compares with the remarkable Mark 1X. This unit is in a class by itself . . . with push-button remote controlled relay functions, plug-in audio elements and all the "extras" that make for flawless recording under the most adverse conditions. From $2145.		X	X	X	X	X	X	OPTIONAL	X	X	X	X	OPTIONAL	X	X	X

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photographic result on Ektachrome film. The visual effect so impressed company officials they subsequently ordered all machinery that would come within the scope of the camera to be painted in these colors.

When shooting scenes in the Harrison factory, lighting problems were encountered because large windows and huge skylights permitted a vast amount of daylight to come through and conflict with the artificial lighting that was necessary for the tungsten type film being used.

"We solved this problem," said Vincent Saizis, "by covering the skylights and windows with tarpaulins. On other instances, Macbeth filters were used with the set lamps to compensate."

An important factor in shooting "Temperatures Made To Order" was the cooperation received from officials of the Harrison Radiator Company. One example is the way they provided neutral backings in many of the factory areas so that distracting backgrounds could be eliminated in certain shots.

Lighting, and especially the power for same, is invariably a problem on any location interior. This is especially true when shooting in color where it becomes vitally important to maintain constant voltage and amperage levels. The Saizis brothers had at their disposal a total of 2,000 amps. In addition to the factory power lines, they obtained additional power from a transformer mounted on a portable dolly which could be moved around the plant at will. Special care was exercised at all times to insure uniform color temperature in the illumination.

Some exciting visual effects were introduced into the picture by trucking or dollying the camera whenever possible, using a four-wheel dolly and tracks.

Danger was encountered, too, when it came time to shoot several vital scenes in the factory's paint spray booth. It was a highly inflammable situation, and every precaution was taken to insure that no sparking of electrical equipment would occur to touch off a fire.

The most uncomfortable scene to photograph, Ted recalls, was inside a sub-zero room where radiators are tested in automobiles under zero temperatures and below.

Photographing "Temperatures" consumed 10,000 feet of 16mm Ektachrome film, was three months in preparation, and required five weeks to shoot. The Saizis brothers admit the subject matter sounded pretty dull when first they were approached to shoot the picture, but the more they became involved, the more exciting and challenging the job became.

"We used a Mitchell 16mm camera," said Ted, "and we photographed 'Temperatures' as meticulously as if it were a feature picture. Instead of typical documentary treatment using simple front lighting, we gave each set-up and each plant employee involved as careful lighting as if the picture were to be released for theatrical distribution."

"Temperatures Made To Order" was subsequently chosen by the National Association of Manufacturers as one of fifteen American films to compete in the Second International Film Festival in Turin, Italy, this year. Later, prints will be added to General Motor Company's motion picture library and made available to school, church, college and business audiences.

Thus what first appeared to be a dull and uninteresting photographic undertaking, ultimately became, for the Saizis brothers, something to challenge their imaginations and abilities. "We enjoyed the problems the production posed and the rewards that came to us in successfully working them out," said Vincent Saizis. ■

CAMERA POINT-OF-VIEW

Continued from Page 541

powerful when haranguing the masses from a balcony.

In terms of the camera, a high angle creates a very similar impression. It places the audience in an exalted position in reference to the players in the scene. Depending upon how the trend of the action develops, it can cause the audience to look at the players either with contempt or compassion—but in any case, the characters in that scene will appear humble to the audience.

Putting it into concrete terms, let us take for example a sequence in which a man is being pursued by bloodhounds. If the action were filmed from the conventional eye-level angle we might not feel especially sorry for the man, because he is bigger than the dogs. In our mind we tend to assume that because he is the dominant figure

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in the scene, he will probably win out against the odds.

On the other hand, let's view the same scene from a high angle. Now the difference in size between the man and the dogs is less obvious. He becomes a hunted thing, nakedly exposed to the camera's commanding eye — and the audience is made to feel superior to him, in a compassionate sort of way.

The high angle, therefore, is used to best advantage to make the audience feel superior to (or feel sorry for) the players in the screen situation. Aside from this psychological aspect, the high-angle shot gives a more comprehensive view of the situation, and creates a lofty perspective that is especially valuable in introducing a new locale.

The Low-Angle Shot: Departing from the conventional eye-level shot in the opposite direction, we find that shooting from a low angle produces some of the most dramatic points-of-view available to the cameraman. The basic effect of the low camera angle is completely different from that of the high-angle, since it tends to exaggerate the importance of the subject which it portrays.

A low-angle forces the perspective of the scene, so that a character thus shown appears to be taller than he really is, and he can be made to actually loom large in the composition. Thus he will more or less dominate the audience psychologically and place it on the defensive. The low-angle shot is especially effective in sequences where a menace is to be portrayed, or where the influence of the character is to be built up for a particular reason of plot. Films with a sinister or mystery theme benefit especially from camera angles of this type.

In a sense, it can be said that a low-angle is an intimate sort of angle, because it often serves to bring the audience more completely into the atmosphere of the scene. Let us suppose, for example, that a character is shown fleeing from the police by crawling through some undergrowth. An eye-level shot of the scene would show the details of the scene quite clearly, but would hardly inspire the desired emotional reaction from the audience. On the other hand, if the same action were shot from a low angle, with the fugitive crawling right up to the lens so the audience could see the terror in

Continued on Page 557

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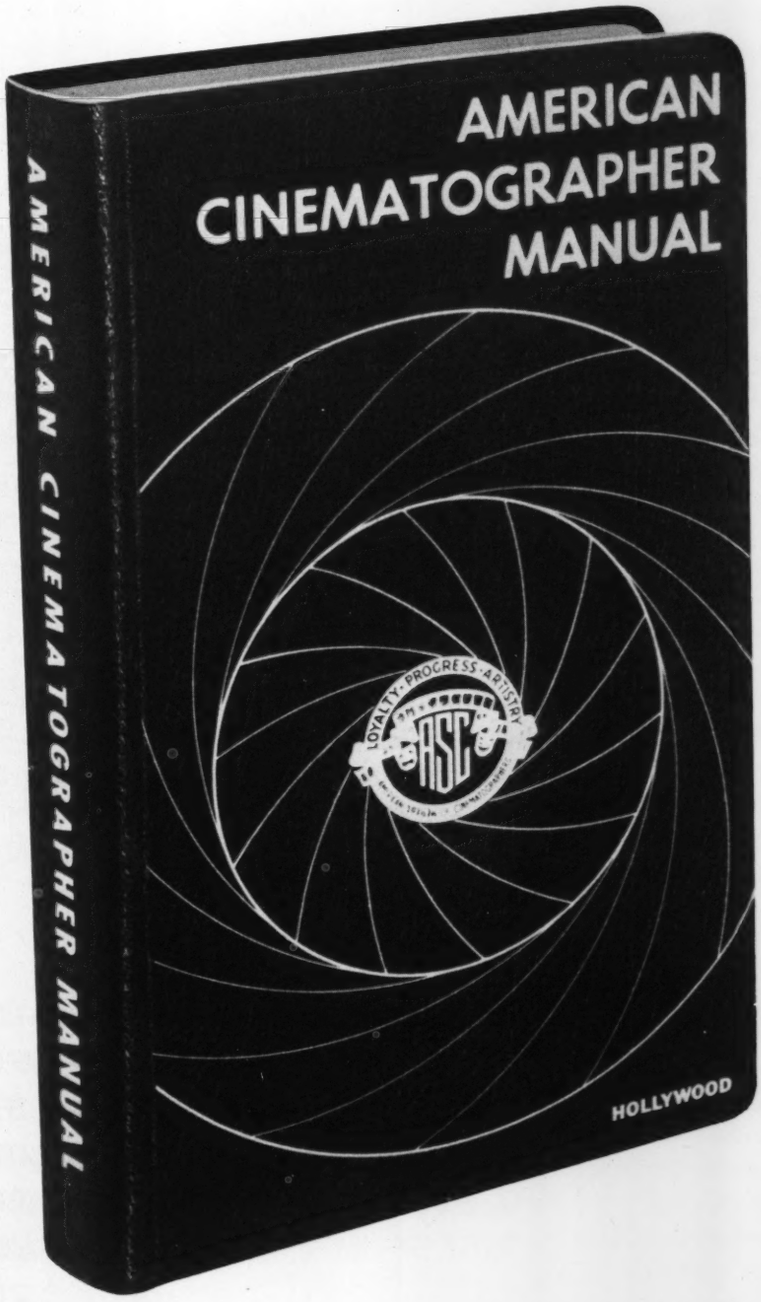

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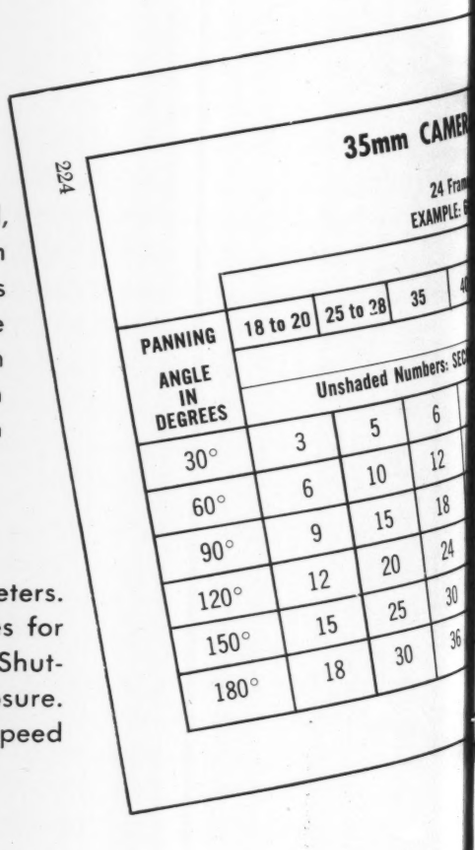

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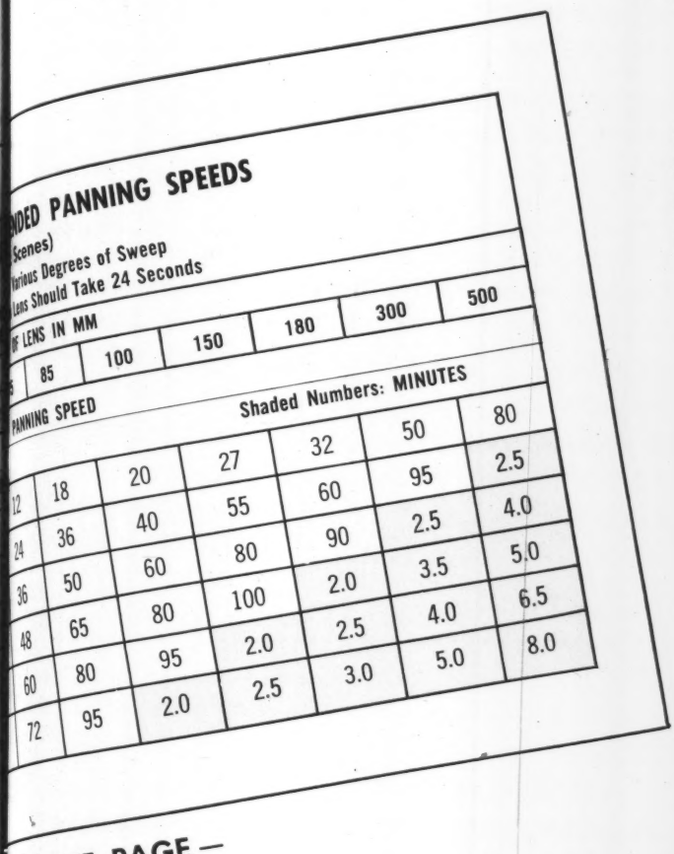

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THE EDITORS: The American Cinematographer Manual is Compiled and Edited by **Joseph V. Mascelli,** free-lance cinematographer and writer with more than twenty years experience in military, industrial, documentary and television motion picture camera work. He is the author of numerous magazine articles on motion picture production from the cameraman's point of view. **Associate Editors are: Arthur Miller, A.S.C.,** a pioneer in the industry, photographed the memorable "Perils of Pauline" starring Pearl White, in 1914. His career is marked with many outstanding theatrical motion pictures. He has been nominated numerous times for the coveted Academy Award, and has won the "Oscar" three times. **Walter Strenge, A.S.C.,** a cameraman of long standing, was one of the first to experiment with the special requirements of early television filming. He is no stranger to the readers of the AMERICAN CINEMATOGRAPHER Magazine, for which he successfully conducts the technical "Question and Answer" column.

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CAMERA POINT-OF-VIEW

Continued from Page 552

his eyes, it would be almost as if the spectators were in the actual locale with him, experiencing the same emotions.

Another function of the low-angle shot—and one which is quite effective—is that of pointing up the compositional importance of a commonplace static subject. A radio tower, for example, is just a radio tower when viewed from a straightforward angle—but shot from a low angle, it becomes an imposing monument of steel towering into the sky.

Utilizing a low camera angle, the photographer can often eliminate a distracting background and show his subject to best advantage against the sky. Or, as a variation of this technique, he can create effective composition or symbolism by shooting the subject from a low vantage point against a dramatic background. In short—the low-angle is a very striking point-of-view if used correctly, and not too often.

Framing Scenes: When a subject in a scene is framed by another object, a direct relationship is established between that subject and its locale. A house framed by trees, for example, is no longer just a house, but part of the landscape.

One of the most effective compositional treatments is the shot in which background subjects are framed by an object in the foreground. This treatment gives added depth and perspective to the scene and tends to draw the audience into the action.

Photographically, such compositions are a bit more tricky to shoot since they require a great depth-of-field in order that both planes of composition be rendered in acceptable forcus. This means that for shots of this type a wide-angle lens is generally used, wth sufficient illumination to allow the lens to be stopped down as far as possible.

The framing of a scenic shot having a person in the foreground provides a fine measuring stick for size and distance. If the focus must favor one of the two subjects, it should be the one that is the most important in the scene.

Point-of-view in cinematography depends greatly upon the perspective created by the lens used—which, in turn, depends directly upon the focal-

If you're going around in circles . . .

length of the lens.

The standard lens (1-inch for 16 mm cameras, 2-inch for 35mm) produces a so-called normal perspective. That is, it covers practically the same angle of view as the human eye. It shows the subject clearly and without any exaggeration of line or proportion.

The wide-angle lens, on the other hand, forces the perspective of the scene, tends to make settings look larger than they actually are, exaggerates apparent distances, and allows for dramatic composition because of its inherently great depth-of-field.

Telephoto lenses tend to flatten out the separate planes of the scene, while magnifying the subject. Because of its short depth-of-field, the telephoto is a fine lens to use for shooting closeups of people, since it throws distracting backgrounds out of focus.

These characteristics should be kept in mind when the selection of a lens is being made for a particular scene, because the choice of lens will have much to do with the effectiveness of the point-of-view.

Let us suppose we are filming a sequence in a long corridor and we wish to point up the setting itself. If we use a standard lens at eye-level, the scene will photograph with normal perspective, and the corridor will appear on the screen as nothing more than unobstrusive background for whatever action develops. But if we photograph the same scene from a low vantage point, using a wide-angle lens, the whole point-of-view of the scene will be changed. The perspective of the corridor will be forced so that it will appear to be twice as long as it really is. The lines of perspective will taper off to a distant point. The tilt created by the low angle will cause straight lines to lean just enough to give the setting a dramatic appearance. Figures in the scene will loom more forcefully in the composition. What was once an ordinary scene will become a dramatic, suspenseful situation. This sort of set-up, of course, should only be used when the mood of the story demands such an atmosphere—never just for the sake of photographic novelty.

Camera point-of-view, in the final analysis, depends primarily upon the cameraman's choice of angle in a specific scene or sequence. In any event, he should match the viewpoint of his camera to the mood and pace of the story and select angles that clearly show the action, but at the same time show what there is to be shown in a fresh and original way. ■

SPECIAL EFFECTS FOR "VOYAGE TO BOTTOM OF SEA"

Continued from Page 533

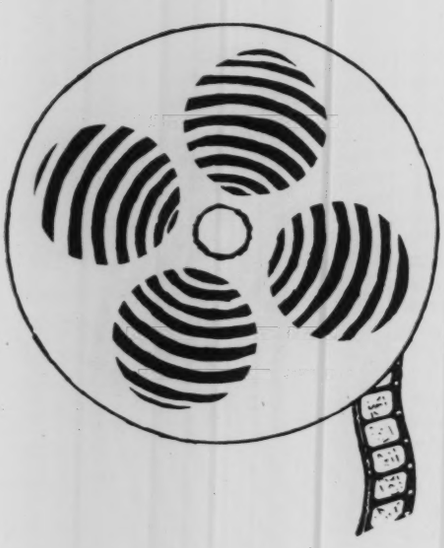
beneath the Polar ice cap, with huge icebergs floating on the surface forming a ceiling. Suddenly the huge 'bergs begin to disintegrate and tremendous ice "boulders" crash down upon the submarine, theatening to crush it. The icebergs, Abbott explained, were simply constructed; metal frame "shapes" were first constructed and then covered with ordinary lathing wire or "mesh." Over this were placed several thicknesses of cheese cloth, and the whole assembly then coated with wax.

A major problem was making these hollow "icebergs" descend below surface of the water at the right speed in order to look realistic. The 'bergs ranged in size from four inches to 24 inches in width. Each had to have its relative bouyancy built in so that the smaller 'bergs would not fall at a faster rate than the larger ones.

The scene was shot with the camera mounted in the studio's diving bell (underwater camera tank), which has two large ports with large convex glass covers. The icebergs were arranged on planks overhead above the water surface, and dropped into the water by technicians as the camera recorded the action. Several takes were made, which required divers to retrieve the various iceberg miniatures and realign them for the shots to follow.

A major challenge to Bill Abbott and his special effects crew was the creation of the Van Allen Belt aflame—a raging inferno that would roar across the entire CinemaScope picture frame and beyond to infinity. For this, flame throwers were used that shot a roaring jet of fire twenty feet in length. Since it was impractical to overcrank the special effects camera more than 4½ times normal speed, the scene was shot using three flame throwers and with the camera operating at approximately 108 frames a second.

In preparing this footage for effects



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printing, a double-frame printing method was used. To effectively eliminate "chattering," the printing was staggered so that each sequence contained one additional frame of the frame before or after the principal frame being photographed. This staggering procedure had the effect of slowing the action down to nine times below normal. The action was staggered a second time, slowing the motion to eighteen times below normal.

In order to fill out the wide proportions of the CinemaScope frame format so that the entire sky across the top of the frame would appear to be in flames, it was necessary to make an optical composite composed of three standard frames of the flame thrower action printed side by side. Several takes were used to mix up the action. They were also staggered in size—that is, some were enlarged and others reduced in order to produce the effect of three planes for an illusion of depth. In order to get the final effect strip to be used in double printing with the foreground action, one strip of film was run through the optical printer a total of fifty-seven times. The final result was an awesome illusion of weight, size and depth created from what started off as a twenty-foot jet of flame.

Much of the action in "Voyage" takes place aboard a submarine, both surfaced and underwater. For these sequences it was necessary to build submarine models in three different sizes in order to accommodate all of the action scheduled in the script. On the surface a twenty-foot model was used. There also was an eight-foot model for use in the tank, and a four-foot model which also was built to scale for the sequence depicting the octopus attacking the sub.

A problem of scale also developed in the scene in which the tiny two-man sub is sent out to cut a mine loose from the nose of the large submarine. Whereas the eight-foot model represented the full-size craft 350 feet long, a two-man submarine supposed to be twenty feet long in actual size would have looked as small as a used pencil. To solve that particular problem, the twenty-foot model of the large submarine was submerged in the tank in a stationary position. It was equipped with an electrically controlled hatch from which a small, eleven-inch model of the sub could be released. Still another and slightly larger model of the sub was built to a scale carefully calculated with respect to the explosion

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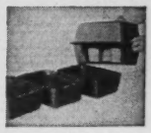

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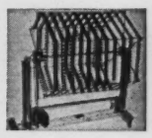

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that was to demolish it, so that the explosion would appear as real as possible.

In a special effects project such as this, Abbott explains, the studio's miniature prop shop contributes substantially. Herb Cheek, head of the shop and considered one of the top experts in the business, supervised the construction of the various models required for "Voyage to the Bottom of the Sea."

Underwater explosions, as a rule, are difficult to stage, particularly from the point of safety, since they are invariably photographed with the camera shooting from a submerged tank and through a glass-covered port. The concussion of an explosion is greater in water than in air, therefore the problem here is how close can the camera work to an explosion without danger of the port collapsing from the concussion.

Filming Underwater Scenes

All of the underwater scenes for this picture were staged and photographed in the studio tank, pictured in the photos, which is about sixty feet square and eleven feet deep. The special effects photography was done with the camera mounted in an open-top diving bell (Fig. 3) set down in the tank. Pontoons attached to the sides kept it erect and prevented it capsizing. Two circular ports covered with convex glass, as previously mentioned, afforded viewing access for the camera. The curvature of the convex glass served to nullify the refraction of the water which, were photography done through a flat glass, would magnify objects underwater about one-third, thus making it necessary to work in a much larger underwater set to achieve the required pictorial depth.

The curved glass, Abbott explains, cuts down refraction and at the same time permits normal perspective. An added advantage is that the camera actually records an aerial image, achieving almost universal focus. It is possible, when shooting through the curved glass and using a 75mm lens at a carefully calculated focus, to achieve a depth of field ranging from 4½ to 12 feet. In miniature work, the depth of field factor is especially critical, particularly when filming with CinemaScope lenses, which are characteristically lacking in depth.

A major problem in underwater photography is getting enough light to permit stopping down for the required depth of field. When this is coupled with the necessity of over-cranking, as it generally is when photographing miniatures in motion, then the lighting situation becomes vastly complicated. In this case, about 90% of the photographic illumination was daylight, supplemented by arc lights above the surface and a few sealed-beam lamps underwater. It was necessary to break up the direct rays of the sun filtering through the ruffled surface of the water because these created an annoying pattern that is unrealistic when you are supposed to be filming at considerable depth. In order to diffuse the direct sunlight, a white muslin scrim was stretched over the entire tank (See Fig. 1), and the lamps used for some of the shots had scrims mounted in front of them.

An interesting challenge presented itself in the underwater shots showing the submarine cruising just below the surface, where the water appeared to reflect the red glow from the fiery sky. At first, Abbott mounted red-filtered lamps on a parallel over the pool and directed their light on the surface of the water. But he discovered that the color would register only when the camera was shooting directly toward a lamp. After a certain amount of stewing over formulas involving physics and mathematics, the dilemma was resolved by placing the filtered lamps under the water, on the bottom of the tank, and beaming them up so that the surface of the water, as seen from below, acted as a mirror and reflected the red glow evenly and in a most convincing manner.

Wave Scale Important

For surface scenes the scale of the waves in relation to the models was a matter of prime importance. Over a period of years rules of thumb have been developed to determine this. The scale of the waves is always relative, not only as to the size of the model, but also to the type of sea to be depicted. Wide-angle CinemaScope lenses take in a tremendous spread of background, making it necessary for the cameraman to work as close as possible to the subject. When filming water miniatures he thus loses a considerable area of water from the camera to the back edge of the tank. This means that a great deal of time and effort must be expended in order to create a diminishing wave perspective. The size of the waves in the foreground have to be built up to match the scale of the model

and the waves which appear beyond and in the background must be gradually diminished in size to impart the illusion of great distance—forced perspective, in a sense.

Mechanically this tricky maneuver was achieved by setting the front wave scale with wind machines, accompanied by the use of plank agitators manipulated in cadence by experienced effects technicians who varied the beat to produce an irregular wave pattern. The entire effect was further enhanced by large mechanical agitators which added a ground swell to the illusion. The trick, Bill Abbott explained, lies in placing and coordinating all the elements to give the effect of an infinite horizon of realistic wave motion in relation to the model. Moreover, the scene must be filmed before the foreground waves reach the rear of the tank and begin to "echo" back. When this happens, the waves stack up vertically and the illusion is ruined.

Camera Speed Formula

Through much trial and error, special effects cameramen have worked out a mathematical formula to provide a ratio between the size of the model and the rate of overcranking needed to maintain a realistic illusion of motion. This ratio is based on the formula that the camera speed is equal to the square root of the scale model. Ideally, this means that when using a model with a scale of ¾-inch to 1-foot (or 1/16 normal size), the camera is operated at four times normal speed.

One of the most spectacular scenes in "Voyage to the Bottom of the Sea" shows the submarine moving into New York Harbor against a background of the United Nations headquarters. To produce it a number of special effects procedures were employed. First, the massive backing behind the tank was painted a brilliant red, so that the color would be reflected on the water as the submarine went through its maneuvers. Then from a large three-by-six-foot mural type photo enlargement of the New York waterfront, the studio's art department made a silhouette painting of black buildings against a white background, then another rendering with the values exactly reversed. From these a dupe negative was made by the travelling matte process to combine the miniature with the silhouette rendering of the city skyline. Finally, the composite shot of the fires was printed into the sky area, using the matte of the buildings to make it appear that

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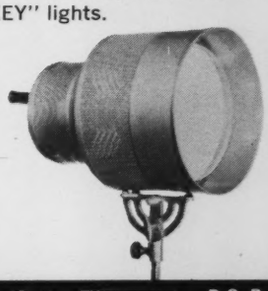

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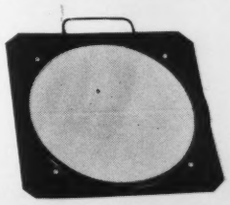

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the fire was behind them.

In filming the sequence in which a giant octupus attacks the submarine, one scene had to show the octopus clinging to the glass ports in the nose of the ship as though it were photographed from within the ship and thus show the underside of the octopus with its tentacles and their suction cups. This shot could have been made easily by means of process photography, but Abbott felt he could get sharper and more realistic images by using the traveling matte process. The full-scale scenes, therefore, were shot with a blue backing behind the port openings. Then a small live octopus, having a tentacle spread of about 20 inches, was induced to cling to a pane of glass mounted before the camera, thus providing a view of its suction-cup studded underside. Shooting this from a distance of five feet with a six-inch lens resulted in a closeup of about 6 inches of the creature's mid-section. When this was matte printed into the ports in the live action scenes, the octopus appeared to be gigantic in size.

"In order to establish scale in shooting miniatures," Abbott points out, "a good practice is to show a person in conjunction with the blow-up of the model the first time it appears in the film. From that point on the audience will subconsciously remember the scale and apply it whether the model is shown alone or with other elements."

Thus it may be seen that psychological effects often must be combined with essentially visual effects to achieve the desired illusion of reality, especially for a phantasy story of this kind. ■

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HIGH-SPEED

Continued from Page 514

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$5 \times 1{,}000 = 1/5{,}000$ second

Because high-speed photography requires high intensity illumination, various types of artificial light sources are used. These include:

(1) Tungsten lamps.
(2) Mercury arcs.
(3) Zirconium arcs.
(4) Electronic flash.
(5) Spark.
(6) Photoflash lamps.
(7) Xenon lamps.

Determination of Picture Taking Rate

Determination of the picture taking rate depends on whether qualitative or quantative analysis of the subject is to be made.

For qualitative analysis, i.e., by projection, a .10 second sequence is very useful. If an event takes place in an estimated 1/10 of a second, the time magnification will be 100 times.

$$\frac{10}{.1} = 100$$

$$\frac{\text{Projection time}}{\text{Event time}} = \text{magnification}$$

Magnification × Projection rate = Picture taking rate.

For silent speed:

$100 \times 16 = 1600$ pictures per second.

For sound speed:

$100 \times 25 = 2400$ pictures per second.

The quantitative estimate for picture taking rate is based on:

$$\frac{\text{Number pictures desired}}{\text{Event time}} = \text{Picture taking rate.}$$

If an event to be analysed takes place in about 1/100 of a second and 50 pictures are required, the exposure rate will be 5,000 fps, calculated thus:

$$\frac{50}{.01} = 5{,}000 \text{ pictures per second.}$$

Lens Coverage

For field width coverage and working distance with a particular lens, divide the field width by the film width to secure the number of times the image will be reduced in size.

$$\frac{\text{Field width}}{\text{Film width}} = \text{Reduction}$$

Estimated working distance is reduction divided by the focal length of the lens. This is applicable for all reductions greater than 10. For those less than 10 the reader may refer to formulas in the "Kodak Lens Handbook".

Lenses are available for high-speed cameras with focal lengths of 3.2mm (168° coverage) to 360 inches. Lenses of less than 35mm focal length should be of inverse telephoto type in order to produce the necessary back focus.

Either plus diopter supplementary lenses or extension tubes may be used for closeups below the minimum lens focusing scale distance or for macrocinematography.

Today, any subject—mechanical or otherwise—that moves too fast to be studied normally by eye, is a potential high-speed camera study. Cinematographers who never before have employed a high-speed camera in their work, may henceforth find occasions when a sequence of high-speed photography will enhance a production if not actually supply the climax. Here, the availability of high-speed cameras on a rental basis will prove convenient. Companies who rent such cameras are now found coast to coast. Among them are Camera Equipment Company, Birns & Sawyer, Traid Corporation, Gordon Enterprises, and Hollywood Camera Company. ■

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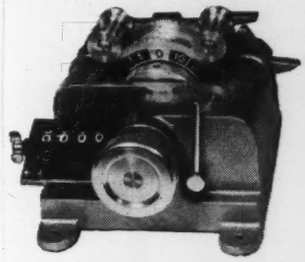

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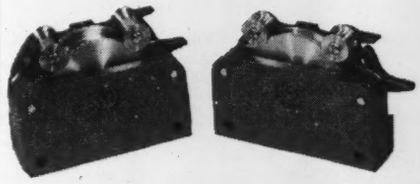

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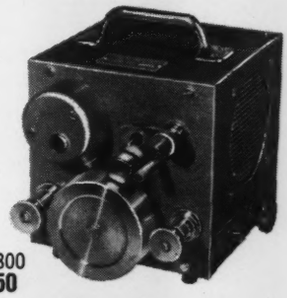

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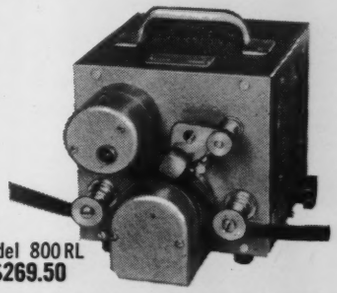

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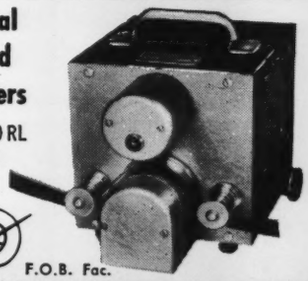

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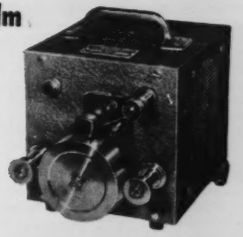

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SHARP "EYES"

Continued from Page 542

a runway. Utilizing the thrust of its own engine, plus the kick of a 130,000 pound thrust Astrodyne rocket, the craft roars off its mobile launcher or from a concrete-and-steel bunker into the blue.

During the system's development stage, a dummy aircraft was repeatedly launched from a mobile carrier operating in desert areas near Albuquerque, New Mexico. It is said that few aircraft development projects ever demanded the coverage by motion picture and instrumentation cameras that the ZEL system received. Some idea of the scope of this phase of the activity may be had from the accompanying photographs which show personnel of North American Aviation, Inc., preparing and using these cameras at the test site. Motion picture records were made of each test with cameras operating at high speeds ranging from 24 to several thousand frames a second. Among the cameras used were Arriflex, Cine Kodak Special, Fastax, and the Eastman High-Speed camera, which is now being manufactured under the trade name of Magnifax by Beckman & Whitley.

Purpose of the ZEL system is to provide the Air Force with a means of dispersing jet fighters close to the front lines in the event of war and launching them without the use of conventional airfields. Planes such as the F-100 can be towed over rough terrain to a desolate area and made ready for launching in the event of an attack.

Capable of carrying a greater bomb load than many World War II bombers, the F-100 is pulled into firing position on its mobile trailer by a self-contained winch, carefully placed on the launcher, and the booster attached. The pilot starts the engine. When ready for takeoff, he squeezes the trigger, igniting the powerful rocket booster. Before the booster burns out the pilot and plane are subject to acceleration forces three times their normal weight.

A further development of the ZEL system is the ability of the Air Force to launch a jet fighter from a shelter designed to withstand the withering blast of an atomic attack. The photo at top of page 524 shows a North American F-100D Super Saber successfully negotiating such a jet-assisted takeoff.

The initial successful test was conducted on the sun-baked desert near Albuquerque by North American Aviation, Inc. The jet, piloted by Al Blackburn of Los Angeles, was blasted into the air from a concrete and steel, cave-like structure. Actual takeoff distance for the plane was less than one inch. Within four seconds, the craft had accelerated to 275 miles an hour and moments later was traveling faster than the speed of sound. ■

KODAK'S REFLEX SPECIAL

Continued from Page 535

built on a modular basis to facilitate easy maintenance as well as interchangeability of optional equipment. For example, the standard drive for the camera is a 110-V synchronous motor which operates it at 24 frames per second. It is readily removed by depressing two single release clutches (B in Fig. 2) and can then be replaced with a variable-speed motor with a speed range of 8 to 64 fps, a drive unit designed for time and motion studies, or a motor for single-frame and animation work.

An innovation is what Kodak terms a "space gate", designed specifically to keep the film moving in the gate on an even plane as it is exposed. Providing a clearance of 0.007" between the aperture plate and the pressure pad, the possibility of the film binding or scratching is virtually eliminated. This feature should be especially helpful when the thicker-emulsioned color films are used in the camera.

A feature of the camera which has developed much favorable comment is the buckle trip device, shown at E in Fig. 2. This operates automatically regardless of the size of the film load in the camera. It serves to promptly stop the camera should the film not feed properly or if there is interference

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KODAK'S REFLEX SPECIAL

Continued from Page 564

of any kind with film travel. As a further safeguard, the camera door cannot be closed if the film is improperly loaded or if any of the internal elements of the film transport mechanism, such as the film retaining spindles, etc., are not in correct position for camera operation.

The entire film-handling mechanism of the camera can be removed for cleaning and maintenance.

The rotary three-lens turret is a standard feature and is equipped with one lens—a 25mm f/1.4 Ekton in a new type bayonet mount which provides push-button ease in the function of interchanging lenses. Among the accessories provided for the Reflex Special are adapters to accommodate lenses in the standard S-type mounts. In addition to the standard 25mm lens, Kodak has available for the camera a full range of lenses from 10mm to 150mm focal length. Also available is a zoom lens with an operating range from 17.5mm to 75mm.

The Reflex Special comes with one 400-foot film magazine, which will also accommodate 100-foot and 200-foot rolls of single- or double-perforated film on camera spools. The camera, used without a magazine, will accommodate 100-foot rolls of film. Finally, there is a rugged 1200-foot magazine available on special order. When it is desirable to use the camera without the external film magazine, there is a cover piece (G in Fig. 2) that may be attached to top of camera, making it light-tight. An additional feature of the cover piece is a fold-down strap handle for carrying the camera.

An important protective feature built into the camera's electrical system is a neon monitor light, which is situated in the remote operating switch, illustrated in Fig. 5, and which indicates when power is being delivered to the camera motor—ideal especially when the camera is being used with a blimp. Essentially, the monitor light protects against inoperative camera due to a loosened electrical cord, etc.

Mention was made earlier of a magnetic sound recording facility. At a later date, the Reflex Special can be factory-equipped with a recording system that will enable the camera to record sync-sound on pre-striped film simultaneously with the picture—with positions of sound and picture separated according to established standards. The recording package, according to Dr. Norwood Simmons of Eastman Kodak Company, who exhibited the camera at a press conference preceding the opening of the recent Technical Symposium of the Society of Photographic Instrumentation Engineers in Los Angeles, will fit neatly into the space normally occupied by hundred-foot film spools within the camera body. The amplifier and power pack to operate the recorder will be contained in a compact six-pound shoulder-strapped case.

Other optional accessories include a variable speed drive, a time-and-motion study drive, and a soundproof blimp. (The camera, incidentally, operates very quietly.).

Unique in merchandising policy is the fact the Reflex Special will be sold directly and exclusively by the staff of the Eastman Kodak Company Motion Picture Film Department, which has offices in New York City, Chicago, Hollywood and Rochester. Base price for the camera, equipped with one 400-foot magazine, 110-volt A.C. 24-fps. sync motor, 25mm f/1.4 lens, adapter for a director-type (Mitchell-type) viewfinder, and a sunshade and filter box, is $1,895.00. ▪

BINGHAM'S BEAT

Continued from Page 539

From the tiny airport at Lashio in the interior the crew traveled to Seagrave's hospital in a caravan of trucks and jeeps. The hospital is located in a village less than a mile from the Chinese border, and natives often come from the other side for treatment.

Although Bingham uses 35mm cameras whenever possible, on this assignment the lighter and more portable 16mm Auricon "Super 1200" was used for the major part of the coverage. For cut-in and cutaway shots he used a hand-held Bell & Howell Filmo.

Sound was recorded by means of the Auricon's single-system magnetic recording unit (which is installed within the camera and augments the optical recording system) and simultaneously on an Ampex ¼-inch tape recorder.

Improvisation was one of the keys to success in this filming assignment. Bingham used the doctor's own ancient generator to power his lighting

equipment. This was a gas-driven, one-piston machine which put out 220 volts. A series-and-parallel box was rigged up to handle the 110-volt lights, which are the only type readily available in Japan.

"We had to be careful to balance the number of lights on lines before we threw the switch or the whole batch would have blown," Bingham said. "I had brought along extra lamps in the event this happened, but our Burmese gaffer was so careful, it never did."

Dr. Seagrave personally narrated most of the film. Each night Bingham set up the Auricon camera in the doctor's office. When all was in readiness, the doctor commented on the sequences which had been shot that day or reminisced upon events which had occurred in previous years.

Considerable pains were taken to match the lighting from night to night. Each light unit and bulb was numbered and its distance and height from the subject in the initial shot measured so that each subsequent set-up would be the same.

The doctor's office was a room 7 by 12 feet in size, and in order to photograph action within it Bingham had to set up his camera outside and shoot through the door. For reverse angles a dolly track was constructed ten feet above the ground outside one of the windows. This permitted making some effective dolly shots and also afforded a range of camera set-ups using the tripod.

To the doctor's tiny office a native mother brought her child—almost dead from malnutrition. As the doctor made his examination and talked to the woman, Bingham's camera captured the heartrending scene on film and in sound. To shoot interior action such as this, Bingham found Eastman Double-X film rendered excellent results. All too-often the locales in which he had to shoot posed the photographic problems of too bright walls and white bed sheets in high contrast with the dark-skinned natives.

Whenever it was possible lighting equipment was arranged in the pattern commonly used on Hollywood sound stages, i.e., key light, fill light, etc. "American television audiences have come to expect the same picture quality in TV news and documentary films that marks Hollywood theatrical films," said Bingham.

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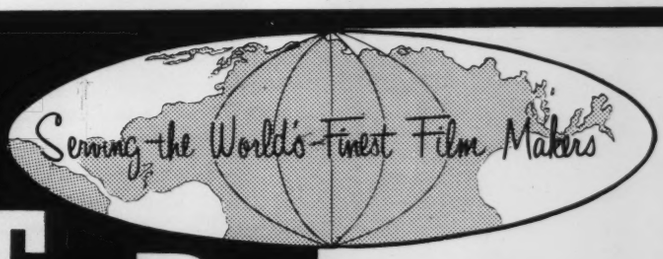

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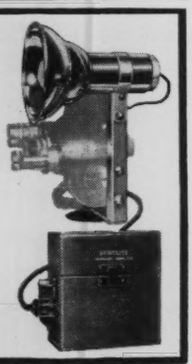

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doctor's office, Bingham took to the more portable Filmo camera to get a number of human-interest shots that otherwise would be difficult to photograph with the larger and less-maneuverable Auricon. In Burmese hospitals, for example, relatives of a patient move in with him to care for his needs. "They cook his food and do everything they can to make him comfortable," Bingham explained further. "You don't just move in, light up—make a production of it—to shoot something like that. You have to gain the friendship of the people, then work as unobtrusively as possible."

Shortly afterward, Bingham got word that there were three native women scheduled to enter the local hospital for Caesarian operations, and that it might be possible to photograph one of the operations. All crew members were alerted and plans carefully drawn. The key lights were set up and left in readiness for the event.

"Soon the 'panic button' was pushed and we went to work," Bingham said.

Cameras and sound equipment were rushed into place. The elderly doctor himself was "wired" for sound: a tiny lavaliere microphone concealed under his clothing.

The crew filmed the dramatic preparations for the surgery plus a number of terrific reaction shots that reflected the mounting tension as the baby was delivered. The doctor described the operation in four languages and supplementary microphones picked up the natural sounds within the operating room for an effective backdrop for his words.

Suddenly, the new-born babe's life began to ebb as the doctor completed the operation. The cameras and mikes picked up his repeated question, "How's the baby?" The nurses, meanwhile, were making frantic efforts to revive the child and did not answer.

"Then the baby began to cry and finally its cries turned to lusty wails," Bingham said. "As the cameras continued to roll, we could actually see its color change from blue to pink."

At the end of the operation the doctor sank wearily into an old wicker chair and held the now lively infant in his arms. The moments of stark life-and death drama were over, but they lived on in picture and sound on Bingham's film.

To wind up the shooting of this assignment Bingham and his crew set up the Auricon at a number of preselected spots to get special shots that would point up the remoteness of the area in which the doctor works. With these shots completed, Bingham totaled up the film exposed on this assignment and found that it amounted 30,000 feet—all of it shot in a period of fourteen days. Most of this was "off-the-cuff" shooting, for Bingham had no script—only a bare outline given him earlier by Burton Benjamin, producer of "Twentieth Century."

Bingham rarely gets emotional about his work. He has seen many a sorrowful sight in covering the Korean War, the French Indochina fighting and the more recent troubles in Laos. But concerning the Dr. Seagrave assignment, he said, "My eyes got misty when I had to say goodbye to the old fellow."

During the 11 years Bingham has spent in the Far East, he has had more than his share of excitement. In the Indochinese fracas a camera jam saved his life. While running back to his jeep to get his second camera, a landmine blew up the spot he had just left, killing the man who had been standing by his side.

In filming the Korean truce talks he managed to sneak into Red territory for exclusive shots. An angry North Korean officer pulled out his pistol and brandished it in Bingham's direction, but the newsman kept his finger on the camera lever and got some highly interesting footage of the irate Red.

In Indonesia, several years ago, Bingham was the only cameraman on hand when paratroopers captured the rebel stronghold of Pakanbaru. It took him eight days to get his precious combat footage out of the jungle to civilization and on an airplane to New York.

For his exceptional photographic achievements the 36-year-old newsman has been honored twice. The first was the National Headliners Award for his Korean War footage and the second, an Encyclopaedia Britannica citation for his camera coverage of the 1954 Tachen Islands evacuation. ■

BEHIND THE CAMERAS

Continued from Page 524

HAROLD STINE, ASC, RAY FERNSTROM, ASC, RALPH WOOLSEY, ASC, "Hawaiian Eye"*.
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